A REVIEW

OF THE

FISHERY INDUSTRIES

OF

THE UNITED STATES

AND THE

WORK OF THE U.S. FISH COMMISSION

BY

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ANALYSIS.

International Fisheries Exhibition.

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His Excellency the American Minister (James Russell Lowell, Esq., LL.D.) in the Chair.

FISHERY INDUSTRIES OF THE UNITED STATES.

I.

Your Excellency, my Lords, Ladies and Gentlemen,—The narratives of Columbus and the early explorers are filled with tales of the number and the diversity of the fishes in the seas and rivers of the West.

European fishermen, Basque, Norman, English, Spanish, and Portuguese, followed in the wake of discovery, and twenty-five years after the landing of Columbus the crews of fifty vessels were plying their handlines over the shoals of the New-found-land.

English mariners were accustomed, however, to resort to the cod-banks of Iceland as early as the time of Henry IV. (1400–1413), and to them, at least, the voyage to the new grounds, a few scores of leagues further from home, was not a particularly remarkable act of enterprise or daring.

The fishermen soon extended their voyages to the region now known as New England. Gosnold, in 1602,

declared that about Cape Cod, from March to May, there was "better fishing, and in as great plenty, as in Newfoundland;" while his companion, Brereton, predicted that "forasmuch as merchants are diligent inquisitors after gains, they will soon remove their trade from Newfoundland."

The first American colony, planted at Jamestown in 1609, owed its permanence chiefly to the abundance of fish and oysters in the adjacent rivers. Its founder, Captain John Smith, was the pioneer of the American fisheries, and in his writings devotes many pages to the discussion of the methods by which they should be carried on. He was a practical fisherman, for his vessel in 1614 took 47,000 fish off the coast of Maine. He realised thoroughly the value of his spoils. "And is it not pretty sport," wrote he, "to haul up two pence, six pence, and twelve pence as fast as you can hale and veare a line? He is a very bad fisher cannot kill in one day with his hooke and line, one, two or three hundred cods." The colonists whom he planted on the shores of the Chesapeake have handed his precepts faithfully down to their descendants, who are to-day hauling pence up out of the water faster than their forefathers ever learned to do. The fisheries of the Chesapeake region yielded in 1880 a product valued at nearly eight and one-half million dollars.

The Massachusetts colonies were founded with still more special reference to the fisheries. We are told in Winslow's "Briefe Narrative of the True Grounds and Causes of the First Planting of New England," that when the Puritans sent agents from Leyden to King James to gain his consent to their going to America, the King at once asked "what profit might arise." They answered in a single word, "Fishing." "So God have my soul," remarked the

King, "'tis an honest trade; 'twas the Apostles' own calling."

The Pilgrims sought out a place for their settlement which "seemed to offer some advantages both for whale and cod fishery," and for two years were sustained in their struggles for food chiefly by the fish which they caught in their slight nets, and the mollusks which they dug upon the shores. They soon received better fishing appliances from England, and at the close of the third summer (1624) they sent home a ship laden with fish, cured with salt of their own manufacture.

Before the middle of the century there was a considerable fleet of ketches, barks, and snows, and at its close Massachusetts was exporting annually to the south of Europe about one hundred thousand quintals of dried codfish, of the value of $400,000.

A century later, at the beginning of the revolutionary war, the New England fishing fleet numbered 665 vessels, with crews numbering 4405 men.

The fisheries of the United States are to-day controlled by the descendants in the seventh and eighth generations of those hardy colonists from the southern coasts of Great Britain, and the greater number of the largest vessels are manned by men of English blood. Our fishing ports are known by such famous English names as Gloucester, Boston, Portland, New Haven, Fairhaven, Dover, Norfolk, Norwalk, Truro, Barnstable, Chatham, Tiverton, Yarmouth and Harwich, New Bedford, New Shoreham, and New London. Our fishes are known by familiar English names; and old English words, long abandoned in the British Isles, still survive in the dialect of our fisher-folk.

It is not inappropriate, then, that the United States established so long ago as colonies of England, upon a founda-

tion in which the fisheries were so closely concerned, should, for the first time taking part in a British International Exhibition, select the occasion of an exhibition of the fisheries.

II.

The progress of our fisheries for the first two hundred years was comparatively slow, and their history monotonous. Little interest was manifested in them, and little was known about them by persons not directly concerned, and their development was not proportionate to that of agriculture, mining, or the industrial arts.

The cod-fishery, the whale-fishery, the mackerel, the shad and alewife, and the oyster fisheries were carried on in 1860 much in the same manner as at the beginning of the century, and their products were prepared and sent to market in accordance with methods not essentially unlike those in use among the earliest fishermen of the colonies.

The war of the rebellion (1861–65) was a serious interruption to all maritime industries, but since its close, and particularly within the past decade, the fisheries have increased in extent and value to a degree without parallel in their previous history.

The census of 1870 indicated their value to be about $11,000,000. This was an under-estimate, but at the time was accepted without challenge or criticism.

The census taken ten years later recorded a value of $44,546,000, and their product in 1883 is at least twenty-four per cent. greater, the value of the various products being fixed at the lowest prices paid "at first hand," or to the fishermen. A fair estimate at wholesale market rates, rather than upon the census basis of fishermen's prices, would at the present time probably be above, rather than below, the sum of $100,000,000.

This rapid increase is due to a number of causes which are mentioned here in the order of their sequence in time rather than in that of their relative importance.

1. The extension of railways into every part of nearly every one of the 2290 counties of our forty-four states and territories, and the consequent lessening of the cost of the delivery of food-products at a distance, has had its influences. Fresh sea-fish are now sold in cities a thousand or more miles from the sea at prices lower than that of beef or mutton. Within three years the fish production of the Gulf of Mexico has been doubled at least by the improvements in the transportation systems of the lower Mississippi Valley.

2. Still more important has been the general adoption of scientific methods of preparation and transportation. Great freezing houses have been built on the Great Lakes, on the Pacific coast, and in the cities of the East, and refrigerator cars are running upon all the trunk lines of railway. Columbia salmon, lake white-fish, cod, bass, Spanish mackerel, and other choice fishes are frozen stiff and packed up in heaps like cordwood, and can be had at any season of the year. Refrigerator cars carry unfrozen fish from sea and lake inland. Smelts and trout, packed in snow in the north, are received in New York by the car-load daily throughout the winter. Halibut are brought from the distant oceanic banks in refrigerators built in the holds of the vessels, and 12,000,000 to 14,000,000 pounds are distributed, packed in ice, to the cities of the interior. Baltimore, from September to April, sends special trains laden with Chesapeake oysters, daily, into the west, and this mollusk is a food for all classes, not a luxury, even beyond the Mississippi.

The Appert process of packing cooked food in hermeti-

cally sealed tin cans is in universal use in the North wherever the supply of fish exceeds the local demand, and "canneries" are also increasing in number in the South, where the harvest of the sea is still, for the most part, ungarnered Tinned fish, especially salmon, lobsters, and sardines, and mackerel, are extensively consumed, and at least $3,000,000 in value is annually exported. In 1880, 2,153,000 salmon were received by the establishments of the Pacific slope, and were packed in 31,453,000 one-pound cans, worth at the factories $3,255,000. "Sardines" to the value of $825,000 were packed in Maine, these being simply young herrings, mostly in cotton-seed oil of domestic manufacture. 4,178,000 pound cans of lobsters were also packed in the factories owned by Maine and Massachusetts.

Improvements in the manufacture of fish-oil and guano, in the production of which, as also in that of medicinal oil, steam is almost universally used, have been numerous and important.

The clean and attractive packages in which canned, dried, smoked, and pickled fish are now exposed for sale led also to the more extensive use of fish for food. The fish-shop of to-day is not so repulsive as of old to sight and smell. Salt codfish is no longer sent to the best markets in bulk, and more than two thousand men, women, and children are now employed in removing skin and bone and packing the fish in neatly cut strips in boxes or in tin-foil covered packages of definite size. In many inland districts the introduction of boneless dried fish in boxes and pickled fish in tins has led to increase of sales, estimated by competent authority as three-fold—this within a period of four years.

The new processes of evaporation and desiccation are certain to increase the inland consumption of sea-fish.

A waste product of some importance is founded upon the boneless fish industry, the makers of fish-glue consuming yearly over 1,000,000 pounds of fish-skins, and the production of glue and isinglass in Massachusetts in 1880 amounted to $450,000.

3. A third source of encouragement to the fishermen has been the greater attention paid by our people to the art of cookery, and the increasing fondness for the luxuries of the table. Fish is ordinarily very cheap, but extravagant prices are paid for brook-trout, and for the choicer varieties of sea-fishes such as the pompano, the Spanish mackerel, the king-fish, and the sheepshead, and especially for the earliest shad or salmon of any particular river. The importation of foreign delicacies like sardines, anchovies, and caviare, is increasing, though excellent imitations of them all are put up by our own manufacturers in large quantities, and in cans so like those imported that only experts can recognise them.

The growing taste for angling among our people has had its weight also in promoting this tendency. Still more influential have been the annual dinners of the "Ichthyophagous Club" of New York, organized for the purpose of introducing into use varieties of fish-food hitherto unrecognised. Another similar cause has been the diffusion of knowledge concerning the fisheries of other countries and the fishes elsewhere esteemed, and the dissipation by chemists of the superstition, once prevalent, that fish is not a nutritive food.

4. As a direct consequence of the extending opportunities for the disposition of the products of the Fisheries, improved apparatus and methods have been devised by which the relative expense of capture has been decreased. All devices are shown in the exhibit of the United States

in the Fisheries Exhibition; indeed, the history of the development of each special form is illustrated by examples. Among the most important may be mentioned:—

(*a*) The development of the fishing schooner to a remarkable degree in speed and adaptability, and a corresponding increase in skill and daring on the part of the sailor-fisherman; coupled with these has been the introduction of cables and anchors of such strength that the schooners can ride out by their aid the heaviest winter gales of our stormy eastern coast.

(*b*) The introduction of steam vessels into the menhaden, oyster, whale, herring, and Great Lake fisheries, over 100 being now thus employed.

(*c*) The introduction of the giant purse-seine and the machinery by which it is set, enabling our mackerel vessels to increase their individual catch tenfold,* and transferring the mackerel fishery from Canadian waters to those of the United States; instrumental also in the evolution of the menhaden fishery, with its annual product of over 1,000,000,000 of fish.

(*d*) The introduction of the lighter and cheaper cotton netting in place of the old-fashioned fabric of hemp.

(*e*) The introduction of the Norwegian gill-net into the winter cod fisheries.

(*f*) The invention of many far-reaching and destructive new forms of harpoon guns, bombs, and explosive lances for the whale fishery.

(*g*) The general introduction of pound-nets or stake-nets along the sandy coasts of the Atlantic and its estuaries for the capture of the migrating summer shoals.

(*h*) The extension of the fishing grounds to new regions,

* A mackerel schooner now takes from 2,000 to 5,000 barrels a year, and the proceeds amount to $15,000 to $38,000.

especially to greater depths, as in the case of the red-snapper fishery of the Gulf of Mexico, and in that of the halibut fishery to deep water on the outer edge of the continental plateau, and the establishment of a halibut fishery in Davis' Straits, and a cod fishery in the Choumagin Islands of Alaska and the Ochotsk Sea.

(*i*) The much more general use of the trawl-line or long-line, which, indeed, was not very extensively employed before 1855, even by the fishermen of Massachusetts. Some of our schooners now set at one time fourteen or more miles of trawl-line with 12,000 to 15,000 hooks, an immense extension having occurred within ten years.

(*k*) In the case of Gloucester, our principal port, a system of co-operative insurance, by which the loss of a vessel is divided among all the capitalists of the port, and is scarcely felt, together with a system of prompt cash payments to the fishermen at the end of each voyage, and the practice of rewarding merit by giving the command of vessels to those who seem particularly deserving, has attracted to that port daring and ambitious men from all parts of America and Europe.

(*l*) The utilization of secondary products of certain fisheries, by adding in an appreciable degree to the profits of each person engaged, has proved an important impetus. Mr. Earll has demonstrated that the secondary products in the cod fisheries amount to more than 14½ per cent. of the value of the fish as taken from the water, raising the receipts of several important ports by about $100,000 each.

(*m*) A great extension of the operations of the Government in the establishment of harbour and coast lighthouses, and life-saving stations, together with the army system of storm-warnings, from all of which the fishermen have received important benefits.

5. The general tendency to expansion has been carefully fostered by the efforts of a considerable number of enthusiastic men,—anglers, philanthropists, and statesmen,—by whom societies and journals have been established, and to which influence is due the appointment of the several government and state commissions, and the appropriation of public money for the propagation and acclimatization of useful fishes.

Especially prominent in this work has been the "American Fish Cultural Association," organized in 1871,* which, under the lead of such men as the Hon. Robert B. Rooseevelt, and Messrs. George Shepard Page, Barnet Phillips, and Eugene G. Blackford, has always led public opinion in matters connected with fishery protection and propagation, and has published a valuable series of Transactions.

The "United States Menhaden Oil and Guano Association," the "New York Fishmongers' Association," the "Boston Fish Bureau," are powerful societies, organized within ten years to direct and stimulate the progress of the industries in which their members are concerned.

6. Finally, as a result and concomitant of increased consumption, increased capture and increased public interest, we come to fish culture. The transplanting of fish was practised and advocated by Gen. Lincoln, Benjamin Franklin, and others, at the close of the last century, and Jacoby, the father of artificial culture, had correspondents in the United States as early as 1770.

Mr. Earll has kindly prepared the following brief history of the science among us :—

"The first attempt at artificial fish culture in the United

* At first called the AMERICAN FISH CULTURISTS ASSOCIATION, but changed in 1878 to the AMERICAN FISH CULTURAL ASSOCIATION, to admit to membership those not actually engaged in fish culture.

States was in 1851, when Dr. Theodatus Garlick, of Cleveland, Ohio, took and impregnated eggs of the brook-trout, *Salvelinus fontinalis*, which were afterwards successfully hatched. When the news of Dr. Garlick's success became known, other parties became interested in the subject, and numerous experiments were made with eggs of the trout and other species. In 1856 public sentiment had developed sufficiently to warrant the Massachusetts Legislature in establishing a Board of Commissioners for investigating subjects relating to the fisheries, and considering the practicability of the artificial propagation of fish at the expense of the State.

"The era of practical fish culture was inaugurated in 1864 by Mr. Seth Green, who built a hatchery and engaged extensively in the work. A year later the New Hampshire Fish Commission was formed, and an attempt was made, at the expense of the State, to re-stock the salmon rivers, this being the first appropriation of public money for fish-cultural purposes. Other hatcheries were established shortly afterwards, and a number of gentlemen turned their attention to fish-cultural pursuits. Prominent among these early workers were Lyman, Green, Ainsworth, Slack, Stone, Atkins, Brackett, and Mather. By the close of 1870 ten of our breeding-stations had established fish commissions, and many had been appropriated for the propagation of brook-trout, salmon, white-fish, lake-trout, and shad.

"In 1871 the United States Fish Commission was established. Arrangements were at once made for a thoroughly scientific investigation of the fisheries, and a little later the work of artificial propagation was begun. The operations of this Commission have increased from year to year, and much has been done in extending the range of important

food-fish, and in re-stocking depleted waters. The shad has been introduced into the waters of the Mississippi Valley and the Pacific Slope; the California salmon and rainbow-trout have been placed in the Atlantic tributaries; and German carp have been distributed over the greater part of the country.

"Up to 1878 the work of the Commission was confined wholly to fresh-water and anadromous species. In this year, however, a station was established at Gloucester, Mass., for the propagation of marine species; and cod, herring, and haddock were successfully hatched. In 1880 successful experiments were made with several food-fishes from our southern seaboard.

"The following is a list of the principal species artificially hatched in the United States, with the date when, and the person by whom, the experiments were made :—

1. Brook trout, *Salvelinus fontinalis*, by Dr. T. Garlick in 1851.
2. White-fish, *Coregonus clupeiformis*, by Müller and Brown in 1857.
3. Lake trout, *Salvelinus namaycush*, by Müller and Brown in 1857.
4. Pike perch, *Stizostedium americanum*, by Müller and Brown in 1857.
5. Atlantic salmon, *Salmo salar*, by J. B. Johnston in 1864.
6. Shad, *Clupea sapidissima*, by Seth Green in 1867.
7. California salmon, *Oncorhynchus chouicha*, Livingston Stone in 1872.
8. Striped bass, *Roccus saxatilis*, M. G. Holton in 1873.
9. Land-locked salmon, *Salmo salar*, var. *sebago*, H. L. Leonard in 1873.
10. Oquassa trout, *Salvelinus oquassa*, C. G. Atkins in 1874.
11. Sea bass, *Serranus atrarius*, by Fred Mather in 1874.
12. Grayling, *Thymallus tricolor*, by Fred Mather in 1875.
13. Sturgeon, *Acipenser sturio*, Seth Green in 1875.
14. Smelt, *Osmerus mordax*, by James Ricardo in 1876.
15. Herring, *Clupea harengus*, Vinal N. Edwards in 1877.
16. Alewife, *Clupea vernalis*, by T. B. Ferguson in 1877.
17. Oyster, *Ostrea virginiana*, W. K. Brooks in 1877.
18. Cod, *Gadus morrhua*, by James W. Milner in 1878.
19. Haddock, *Melanogrammus æglefinus*, by R. Edward Earll in 1879.

20. Carp, *Cyprinus carpio*, by Rudolph Hessels in 1879.
21. Spanish mackerel, *Scomberomorus maculatus*, R. Edward Earll in 1880.
22. Cero, *Scomberomorus regalis*, by R. Edward Earll in 1880.
23. Moon-fish, *Chætodipterus faber*, by R. Edward Earll in 1880.
24. Silver gar, *Belone longirostris*, Marshall McDonald in 1881.
25. Gold fish, *Carassius auratus*, by Rudolph Hessel in 1881.
26. Tench, *Tinca vulgaris*, by Rudolph Hessel in 1881.
29. Soft-shelled clam, *Mya arenaria*, J. A. Ryder, 1881.

"Within the last few years the improvements in the apparatus and methods of fish culture have been very marked. Experience has enabled the fish culturists to improve upon the old styles of boxes and troughs, and the hatching of eggs of additional species has necessitated the invention of new forms.

"The improvements in apparatus for heavy eggs, like those of the trout and salmon, have been chiefly in the direction of economy of space and convenience of handling. The hatching-box used by Dr. Garlick, a simple rectangular trough, was soon replaced by the glass grill, introduced from Europe. Later still came the Clark trough, Holton box, Atkins' trough, Stone basket, and Ferguson jar. Models of each of these may be seen in the United States Department at the Fisheries Exhibition.

"Semi-buoyant eggs, like those of the shad and white-fish, are treated in a manner peculiarly Trans-Atlantic. The first, and for some years the only apparatus employed, was the floating box, invented by Seth Green. Next came the Bryan box, and later the Bell and Mather cone, Chase's jar, Clark's jar, Ferguson's bucket, McDonald's jar, and Bower's trough.

"Adhesive eggs, like those of the smelt, herring, and perch, are successfully hatched in the Ricardo and Clark boxes, and their manipulation is greatly facilitated by the aid of the McDonald egg-reel. Floating eggs, including

those of the cod, Spanish mackerel, and moonfish, are hatched in floating boxes so arranged as to utilise the action of the waves, and in apparatus invented by Clark and Chester. A description of these, or indeed of any of the forms of apparatus above mentioned, is wholly unnecessary, as full-size apparatus, or working models of the same, may be seen in the Fish Cultural Department of the United States Exhibit in the Fisheries Exhibition.

"Beside the improvement of apparatus, radical changes have been made in the methods of fish culture. The most important of these is the building of movable floating hatcheries, in the form of barges and steamers, by the United States Fish Commission. By means of these, different spawning grounds may be visited during the same season, and the result of the work enormously increased, with a comparatively small increase in its cost. The application of steam for pumping the water and for working the apparatus is also of great value. Equally important with these is the improvement in the methods of transportation. Formerly the fish were carried in small quantities in the baggage-cars of ordinary passenger-trains, but refrigerator cars, built expressly for the purpose, are now almost exclusively employed. Trained experts are placed in charge of these cars, and immense numbers of fish are now distributed with small loss and a great reduction in cost as compared with the old method."

In 1866, Massachusetts organised the first state commission. All except eleven states and territories now have similar organizations. In the accompanying table, prepared by Mr. C. W. Smiley, are shown the dates of organization of the several state commissions, together with the appropriations up to 1880. A similar table, complete to 1883, has been prepared, but has not yet been received in London.

TABLE of PUBLIC APPROPRIATIONS for the UNITED STATES FISH COMMISSION and for TWENTY-EIGHT STATE COMMISSIONS.

NOTE—Arkansas, Oregon, Tennessee, Texas, and Washington, have fish commissions, but have never made any appropriation. In North Carolina the Commissioner of agriculture is ex-officio Commissioner of the Fisheries, and the expense is defrayed from the agricultural appropriations. The remaining eleven states and territories — Arizona, Dakota, Delaware, Florida, Idaho, Indiana, Louisiana, Mississippi, Montana, New Mexico, and Utah—have never had state commissions.

UNITED STATES, 1871–9		476,200
EASTERN STATES (6).		
Maine, 1867–80	36,975	
New Hampshire, 1866–79 . .	22,663	
Vermont, 1871–9	7,800 ?	
Massachusetts, 1866–79 . . .	80,500	
Rhode Island, 1870–79 . . .	10,500	
Connecticut, 1868–80 . . .	43,300	
MIDDLE STATES (3).		201,738
New York, 1868–79	165,000	
New Jersey, 1872–80. . . .	29,500	
Pennsylvania, 1873–80 . . .	99,630	
SOUTHERN STATES (6).		294,130
Maryland, 1874–80	76,500	
Virginia, 1875–79	15,000	
West Virginia, 1877–79 . . .	3,900	
South Carolina, 1879 . . .	800	
Georgia, 1876–79	2,000	
Kentucky, 1876–80	11,000	
WESTERN STATES (13).		109,200
Ohio, 1873–80.	29,000	
Illinois, 1880–81	3,000	
Michigan, 1873–80	53,000	
Wisconsin, 1873–80	38,860	
Minnesota, 1874–80	22,500	
Iowa, 1874–81	22,750	
Missouri, 1877–80	7,000	
Kansas, 1877–80	2,000	
Nebraska, 1879–80	1,000	
Colorado, 1877–80	2,400	
Nevada, 1877–80	5,000	
California, 1870–79	37,000	
Wyoming, 1880	1,600	
		225,110
		1,306,378

III.

The entire number of fishes inhabiting the waters of the United States is about 1400. Over 300 of these have a recognised economic value. There is also the usual number of species of whales and seals, several reptiles of industrial importance, and an abundance of mollusks and crustaceans, though, with the exception of the oyster, the clams, the lobster and the blue-crab, the value of these is at present not fully realised.

With a coast-line of nearly 7000 miles,* extending almost from the tropics to the pole, and with fishing fleets in Arctic, Temperate and Tropical Seas, the United States has fisheries corresponding to every kind known elsewhere, except the pearl and the coral fisheries. In hardly any direction have the fisheries reached their fullest development, and many important species, in good esteem elsewhere, are here totally neglected; skates are despised, and millions of pounds annually thrown away. The weight of edible fish taken from the waters of the United States in 1880 is over 1,500,000,000 pounds. This estimate does not include the product of the inland fisheries, other than those of the great lakes, nor the shells of the mollusks.

IV.

Fishing Grounds.—The off-shore fisheries are prosecuted on the great oceanic banks extending from Nantucket to Labrador, and upon the ledges and shoals between these and the coast.

The great Purse-seine fisheries for mackerel and men-

* The coast-line, not including that of Alaska, nor of the bays and sounds, with the exception of Long Island Sound, is stated by the Coast and Geodetic Survey to extend to a length of 5013 miles.

haden are carried on north of Cape Hatteras at distances from the shore varying from one mile to one hundred and fifty miles. The fishing-grounds in the Gulf of St. Lawrence, formerly frequented by many hundreds of American vessels, have been entirely abandoned since the introduction of the Purse-seine. The oyster fishery is located for the most part between Cape Hatteras and Cape Cod, chiefly in the great inland bays. In all the great rivers of the Atlantic coast are fisheries for the anadromous shad and the two species of alewife. About the Keys of Southern Florida is an extensive sponge fishery, and on the shoals of the Gulf of Mexico the red snapper and grouper fisheries are yearly increasing in value. The fur-seal fishery is chiefly located upon the Pribylov Islands of Alaska. A small fleet of vessels yearly penetrates to the ice-bound islands of the Antarctic for seal-skins and sea-elephant oil. The whaling fleet, with head-quarters at New Bedford and San Francisco, in the main frequent the North Pacific, though a number of smaller vessels, many of them from Provincetown, pursue the sperm whale in tropical waters. The salmon fishery is seated chiefly upon the Columbia River and its tributaries, though other rivers in Oregon and California produce large quantities of salmon, which is extensively "canned" and exported. The most valuable product of the Great Lake fisheries is the whitefish.

Fishing Towns and Fishermen.—The principal fishing ports are on the eastern coast north of the entrance to Chesapeake Bay: San Francisco has a large interest in the seal and whale fisheries and is a mercantile centre of the salmon canning interest, while Pensacola and New Orleans and Key West are local centres for the fisheries of the Gulf of Mexico. Baltimore and Norfolk control the oyster fishery; Greenport, Tiverton, and New London, the

menhaden industry; New Bedford, Provincetown and Edgartown the whale fishery; and New London and Stonington the sea-elephant fleet of the Antarctic. Eastport and Portland are the most prominent lobster centres; and Eastport practically controls the sardine industry.

The general fisheries are becoming concentrated in a few cities, and while formerly fifty small local fleets were recognised, the commercial fisheries are now carried on chiefly from Gloucester, Portland, Boston, though Provincetown, with Boothbay and some other minor ports of Maine, must still be recognised. New York, Philadelphia, Norfolk, Savannah, and San Francisco have market fleets of some importance.

Fishermen.—For every man engaged in the fisheries there is at least one other man who is dependent to a considerable extent upon his labours for support. To the class of "shoresmen" belong (1) the capitalists who furnish supplies and apparatus for the use of the active fishermen; (2) the shopkeepers from whom they purchase provisions and clothing; and (3) the skilled labourers who manufacture for them articles of apparel, shelter, and the apparatus of the trade. In addition to the professional fishermen, there is a large class of men who have been called "semi-professional" fishermen—men who derive from the fisheries less than half of their entire income. Taking into account all those persons who are directly employed in the fisheries for a larger or smaller portion of the year, those who are dependent upon fishermen in a commercial way for support, and the members of their families who are actually dependent upon their labours, it cannot be far out of the way to estimate the total number of persons dependent on the fisheries at from 800,000 to 1,000,000.

Of the twenty-nine states and territories whose citizens are engaged in the fishery industry, sixteen have more than a thousand professional fishermen. The most important of these states is, of course, Massachusetts, with 17,000 men.

The majority of our fishermen are native-born citizens of the United States, although in certain localities there are extensive communities of foreigners. Most numerous of these are the natives of the British provinces, of whom there are at least 4000 employed in the fisheries of New England. There are, probably, not less than 2000 Portuguese, chiefly the natives of the Azores and of the Cape Verd Islands. Very many of the Portuguese have brought their families with them, and have built up extensive communities in the towns whence they sail upon their fishing voyages. There are also about 1000 Scandinavians, 1000 or more of Irish and English birth, a considerable number of French, Italians, Austrians, Minorcans, Slavs, Greeks, Spaniards, and Germans. In the whaling fleet may be found Lascars, Malays, and a large number of Kanakas, or natives of the various South Sea Islands. In the whale fishery of Southern New England a considerable number of men of partial Indian descent may be found, and in the fisheries of the Great Lakes—especially those of Lake Superior and the vicinity of Mackinac—Indians and Indian half-breeds are employed.

The salmon and other fisheries of Puget Sound are prosecuted chiefly by the aid of Indian fishermen. In Alaska, where the population depends almost entirely upon the fisheries for support, the head of every family is a professional fisherman, and, upon a very low estimate, one-fourth of the inhabitants of Alaska should be considered as fishermen. Few of them catch fish for the use of others than

their own immediate dependents. Only one Chinaman has, as yet, enrolled himself among the fishermen of the Atlantic coast, but in California and Oregon there are about 4000 of these men, all of whom, excepting about 300, are employed as factory hands in the salmon canneries of the Sacramento and Columbia basins. The 300 who have the right to be classed among the actual fishermen, live for the most part in California, and the product of their industry is, to a very great extent, exported to China, although they supply the local demands of their countrymen resident on the Pacific coast.

The negro element in the fishing population is somewhat extensive. We have no means of ascertaining how many of this race are included among the native-born Americans returned by the census reporters. The shad fisheries of the South are prosecuted chiefly by the use of negro muscle, and probably not less than 4000 or 5000 of these men are employed during the shad and herring season in setting and hauling the seines. The only locality where negroes participate to a large extent in the shore fisheries is Key West, Fla., where the natives of the Bahamas—both negro and white—are considered among the most skilful of the sponge and market fishermen. Negroes are rarely found, however, upon the sea-going fishing vessels of the North. There is not a single negro among the 5000 fishermen of Gloucester, and their absence on the other fishing vessels of New England is no less noteworthy.*

* Prof. Goode referred also to the mental and physical traits of the New England fishermen, their enterprise as shown in their readiness to adopt improved methods, their intelligence and public spirit. He spoke also of the education of the young fishermen, and the injury to good seamanship resulting from the custom of deferring the shipment of boys who formerly entered the business at the age of ten or twelve

There is, however, a considerable sprinkling of negroes among the crews of the whaling vessels of Provincetown and New Bedford, the latter alone reporting over 200. These men are, for the most part, natives of the West India Islands, such as Jamaica and St. Croix, where the American whalers engaging in the Atlantic fishery are accustomed to make harbour for recruiting and enrolling their crews. As a counterpart of the solitary Chinamen engaged in the Atlantic fisheries we hear of a solitary negro on the Pacific coast, a lone fisherman, who sits on the wharf at New Tacoma, Washington Territory, and fishes to supply the local market.

The number of foreign fishermen in the United States, excluding 5000 negroes, and 8000 Indians and Esquimaux, who are considered to be native-born citizens, probably does not exceed 10 to 12 per cent. of the total number, as is indicated by the figures which have already been given. Considerably more than one-half of the fishing population of the United States belongs to the Atlantic coast north of the capes of Delaware ; of this number at least four-fifths are of English descent. They are by far the most interesting of our fishermen, since to their number belong the

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but who now remain on shore until they are fifteen or sixteen, and have had their perceptive faculties dulled by school training. Reference was made to the morality of the fishermen, the strict observance of the Sabbath to be met with among large classes of them, and the entire absence of ardent spirits on the fishing vessels. The character of their favourite books and newspapers, their amusements, their dialect and their superstitions were discussed. The chief diseases were noted to be dyspepsia and rheumatism. They are, as a rule, long lived, though the fishing population of large ports like Gloucester is decimated by disaster every year or two. The financial profits vary from $1000 to $100 a year for each man, though sometimes a year's work results solely in an embarrassing burden of debts.

20,000 or more men who may properly be designated the "sailor fishermen" of the United States,—the crews of the trim and swift-sailing vessels of the sea-going fishing fleet which ought to be the chief pride of the American marine, and which is of such importance to our country as a training school for mariners, and as a medium through which one of the most valuable food resources of the continent is made available.

Statistics.—By statistics prepared for the tenth census, an abstract of which is herewith presented, it has been shown that the number of persons employed in the fishery industries of the United States was 131,426, of whom 101,684 were fishermen, and the remainder shoresmen. The fishing fleet consisted of 6605 vessels (with a tonnage of 208,297·82) and 44,804 boats, and the total amount of capital invested was $37,955,349, distributed as follows:—Vessels, $9,357,282; boats, $2,465,393; minor apparatus and outfits, $8,145,261; other capital, including shore property, $17,987,413.

The value of the fisheries of the sea, the great rivers and the Great Lakes, was placed at $43,046,053, and that of those in minor inland waters, at $1,500,000—in all, $44,546,053.

The fisheries of the New England States are the most important. They engage 37,043 men, 2066 vessels, 14,787 boats, and yield products to the value of $14,270,393.

Next to New England in importance are the South Atlantic States, employing 52,418 men, 3014 vessels (the majority of which are small, and engaged in the shore and bay fisheries), 13,331 boats, and returning products to the value of $9,602,737.

Next are the Middle States, employing in the coast fisheries 14,981 men, 1210 vessels, 8293 boats, with products to the amount of $8,676,579.

s. Value.	Value of Minor Apparatus and Outfits.	Othe includ Pr	Fishery.	Sponge Fishery.	Marine Salt Industry.	
,465,393	$8,145,261	$17,	93,852	$200,750	$305,890	
739,970	5,038,171	9,	78,900	..	3,890	
546,647	674,951	1,	32,900	..	..	
640,508	1,145,878	4,	68,852	..	..	
50,173	52,823		13,200	200,750	..	
404,695	467,238	1,	10,000	..	302,000	
83,400	766,200		..	..	..	
10,215	7,000		44,950	..	..	1
60,000	7,000		..	..	..	2
91,485	205,840		..	..	302,000	3
73,585	375,535		72,875	..	..	4
33,227	70,324		87,725	..	..	5
28,508	39,927		15,950	200,750	..	6
15,425	18,445		35,000	..	..	7
2,000	11,900		..	..	..	8
1,650	20,210		..	..	..	9
4,800	18,000		00,000	..	..	10
245,624	934,593	1,	37,500	..	..	11
186,448	297,145	4,	30,476	..	..	12
351,736	3,528,925	7,	05,550	..	3,890	13
10,345	272,920		..	..	..	14
900	3,760		..	..	..	15
4,600	1,600		10,000	..	..	16
7,780	60,385		6,050	..	..	17
223,963	232,339		80,625	..	..	18
289,885	390,200	1,	77,050	..	..	19
123,175	225,436		60,000	..	..	20
29,830	253,795		..	..	..	21
246,600	245,750		..	..	..	22
13,272	40,538		87,500	..	..	23
61,245	138,733		56,925	..	..	24
9,790	25,985		20,000	..	..	25
15,000	4,400		47,300	..	..	26
292,720	560,763		18,376	..	..	27
6,610	8,648		10,000	..	..	28
24,975	145,165		..	..	..	29

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STATISTICS OF THE FISHERIES OF THE UNITED STATES IN 1880.

Prepared for the Tenth Census, under the direction of G. Brown Goode.

	STATES AND TERRITORIES.	GRAND TOTAL.			PERSONS EMPLOYED.		APPARATUS AND CAPITAL.							VALUE OF PRODUCTS BY FISHERIES.							
							Vessels.			Boats.											
		Persons Employed.	Capital Invested.	Value of Products.	Fishermen.	Shoresmen.	Number.	Tonnage.	Value.	Number.	Value.	Value of Minor Apparatus and Outfits.	Other Capital including Shore Property.	General Fisheries.	Whale Fishery.	Seal Fishery.	Menhaden Fishery.	Oyster Fishery.	Sponge Fishery.	Marine Salt Industry.	
	The United States	Number. 131,426	$37,955,349	$43,046,053	Number. 101,684	Number. 29,742	6,605	208,297·82	$9,357,282	44,804	$2,465,393	$8,145,261	$17,987,413	$22,405,018	$2,323,943	$2,289,813	$2,116,787	$13,403,852	$200,750	$305,890	
	New England States	37,043	19,937,607	14,270,393	29,838	7,205	2,066	113,602·59	4,562,131	14,787	739,970	5,038,171	9,597,335	10,014,645	2,121,385	111,851	539,722	1,478,900	..	3,890	
	Middle States, exclusive of Great Lake fisheries	14,981	4,426,078	8,676,579	12,584	2,397	1,210	23,566·93	1,382,000	8,293	546,647	674,951	1,822,480	2,882,294	..	..	1,261,385	4,532,900	..	..	
	Southern Atlantic States	52,418	8,951,722	9,602,737	38,774	13,644	3,014	60,886·15	2,375,450	13,331	640,508	1,145,878	4,789,886	2,217,797	408	..	315,680	7,068,852	..	..	
	Gulf States	5,131	545,584	1,227,544	4,382	749	197	3,009·86	308,051	1,252	50,173	52,823	134,537	713,594	..	..	..	313,200	200,750	..	
	Pacific States and Territories	16,803	2,748,383	7,484,750	11,613	5,190	56	5,463·42	546,450	5,547	404,695	467,238	1,330,000	4,792,638	202,150	2,177,962	..	10,000	..	302,000	
	Great Lakes	5,050	1,345,975	1,784,050	4,493	557	62	1,768·87	183,200	1,594	83,400	766,200	313,175	1,784,050	..	..	..	..	..	..	
1	Alabama	635	38,200	119,275	545	90	24	317·20	14,585	119	10,215	7,000	6,400	74,325	..	..	..	44,950	..	..	1
2	Alaska	6,130	447,000	2,661,640	6,000	130	..	..	..	3,000	60,000	7,000	380,000	564,640	500	2,096,500	..	..	..	..	2
3	California	3,094	1,139,675	1,860,714	2,089	1,005	49	5,246·80	535,350	853	91,485	205,840	307,000	1,341,314	201,650	15,750	..	..	..	302,000	3
4	Connecticut	3,131	1,421,020	1,456,866	2,585	546	291	9,215·95	514,050	1,173	73,585	375,535	457,850	383,887	32,048	111,851	256,205	672,875	..	..	4
5	Delaware	1,979	268,231	997,695	1,662	317	69	1,226·00	51,600	839	33,227	70,324	113,080	309,029	..	..	941	687,725	..	..	5
6	Florida	2,480	406,117	643,227	2,284	196	124	2,152·97	272,645	1,058	28,508	39,927	65,037	426,527	..	..	..	15,950	200,750	..	6
7	Georgia	899	78,770	119,993	809	90	1	12·00	450	358	15,425	18,445	44,450	84,993	..	..	..	35,000	..	..	7
8	Illinois	300	83,400	60,100	265	35	3	209·73	8,500	101	2,000	11,900	61,000	60,100	..	..	..	..	..	..	8
9	Indiana	52	29,360	32,740	45	7	1	21·90	2,500	15	1,650	20,210	5,000	32,740	..	..	..	..	..	..	9
10	Louisiana	1,597	93,621	392,610	1,300	297	49	539·69	20,821	165	4,800	18,000	50,000	192,610	..	..	..	200,000	..	..	10
11	Maine	11,071	3,375,994	3,614,178	8,110	2,961	606	17,632·65	633,542	5,920	245,624	934,593	1,562,235	3,576,678	..	..	..	37,500	..	..	11
12	Maryland	26,008	6,342,443	5,221,715	15,873	10,135	1,450	43,500·00	1,750,000	2,825	186,448	297,145	4,108,850	479,388	..	..	11,851	4,730,476	..	..	12
13	Massachusetts	20,117	14,334,450	8,141,750	17,105	2,952	1,054	83,232·17	3,171,189	6,749	351,736	3,528,925	7,282,600	5,581,204	2,089,337	..	61,769	405,550	..	3,890	13
14	Michigan	1,781	442,665	716,170	1,600	181	36	914·42	98,500	454	10,345	272,920	60,900	716,170	..	..	..	..	..	..	14
15	Minnesota	35	10,160	5,200	30	5	1	33·59	5,000	10	900	3,760	500	5,200	..	..	..	..	..	..	15
16	Mississippi	186	8,800	22,540	100	76	..	..	..	58	4,600	1,600	2,600	12,540	..	..	..	10,000	..	..	16
17	New Hampshire	414	209,465	176,684	376	38	23	1,019·05	51,500	211	7,780	60,385	89,800	170,634	..	..	..	6,050	..	..	17
18	New Jersey	6,220	1,492,202	3,176,589	5,659	561	590	10,445·90	545,900	4,065	223,963	232,339	490,000	949,678	..	..	146,286	2,080,625	..	..	18
19	New York	7,266	2,629,585	4,380,565	5,630	1,616	541	11,582·51	777,600	3,441	289,885	390,200	1,171,900	1,689,357	..	..	1,114,158	1,577,050	..	..	19
20	North Carolina	5,274	506,561	845,695	4,729	545	95	1,457·90	39,000	2,714	123,175	225,436	118,950	785,287	408	..	..	60,000	..	..	20
21	Ohio	1,046	473,800	518,420	925	121	9	359·51	38,400	487	29,830	253,795	151,775	518,420	..	..	..	..	..	..	21
22	Oregon	6,835	1,131,350	2,781,024	2,785	4,040	..	..	..	1,360	246,600	245,750	639,000	2,776,724	..	4,300	..	..	..	..	22
23	Pennsylvania	552	119,810	320,050	511	41	11	321·99	10,500	156	13,272	40,538	55,500	132,550	..	..	..	187,500	..	..	23
24	Rhode Island	2,310	596,678	880,915	1,602	708	92	2,502·77	191,850	734	61,245	138,733	204,850	302,242	..	..	221,748	356,925	..	..	24
25	South Carolina	1,005	66,275	212,482	964	41	22	337·32	15,000	501	9,790	25,985	15,500	192,482	..	..	..	20,000	..	..	25
26	Texas	601	42,400	128,300	491	110	..	..	..	167	15,000	4,400	23,000	81,000	..	..	..	47,300	..	..	26
27	Virginia	18,864	1,914,119	3,124,444	16,051	2,813	1,446	15,578·93	571,000	6,618	292,720	560,763	489,636	602,239	..	..	303,829	2,218,376	..	..	27
28	Washington	744	30,358	181,372	729	15	7	216·62	11,100	334	6,610	8,648	4,000	109,960	..	61,412	..	10,000	..	..	28
29	Wisconsin	800	222,840	253,100	730	70	11	220·25	26,700	319	24,975	145,165	26,000	253,100	..	..	..	..	..	..	29

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Next are the Pacific States and Territories with 16,803 men, 56 vessels, 5547 boats, and products to the amount of $7,484,750. The fisheries of the Great Lakes employ 5050 men, 62 vessels, and 1594 boats, with products to the amount of $1,784,050. The Gulf States employ 5131 men, 197 vessels, and 1252 boats, yielding products to the value of $545,584.

V.

Enumeration of the Fishery Industries. — There is a considerable number of distinct and separate fisheries and fishery industries, each with apparatus, methods, personnel, and products peculiar to itself. For convenience of discussion, these may be grouped under forty-seven heads, as follows :—

A. Ocean Fisheries.—(*Fishermen living on the Vessels and making Long Voyages when necessary.*)

1. The Whale Fishery.
2. The Antarctic Seal and Sea Elephant Fishery.
3. The Grand Bank Cod Fishery.
4. The Georges Bank Cod Fishery.
5. The Alaskan Cod Fishery.
6. The Winter Haddock Fishery.
7. The Fresh Halibut Fishery.
8. The Salt Halibut Fishery.
9. The Mackerel Fishery.
10. The Swordfish Fishery.
11. The Hake and Cusk Fishery.
12. The Red Snapper and Grouper Fishery.
13. The Menhaden Fishery.
14. The Herring Fishery and Sardine Industry.

B. Coast Fisheries.—(*Chiefly from Small Boats*).

15. The New England Shore Cod Fishery.
16. The Mullet Fishery.
17. The Eel Fishery.
18. The New England Pound and Trap Fishery.
19. The Lobster Fishery.
20. The Crab Fishery.
21. The Prawn and Shrimp Fishery.
22. The Oyster Fishery.
23. The Scallop Fishery.
24. The Sponge Fishery.
25. The Sea Otter Fishery.
26. The New England Shore Fishery.
27. The Middle States Shore Fishery.
28. The S. Atlantic Shore Fishery.
29. The Gulf Shore Fishery.
30. The California Shore Fishery.

C. River and Lake Fisheries.

31. The Shad and Alewife Fisheries.
32. The Western Salmon Fishery.
33. The Eastern Salmon Fishery.
34. The Great Lake Whitefish Fishery.
35. The Smelt Fishery.
36. The River Sturgeon Fishery.
37. The Lake Sturgeon Fishery.
38. The General Great Lake Fishery.
39. The Inland Lake and Creek Fishery.

D. Strand Fisheries and Shore Industries.

40. The Alaska Seal Fishery.
41. The Turtle and Terrapin Fishery.
42. The Clam Fishery.
43. The Quahog Fishery.
44. The Abalone Fishery.
45. The Irish Moss Industry.
46. The Marine Salt Industry.
47. The Seaweed Industry.

Grouping the fisheries by their value, they stand somewhat as follows :—

A. Producing over $1,000,000.*

The Oyster Fishery	$13,439,000
The Cod Fisheries	4,000,000
The Pacific Salmon Fishery	3,300,000
The Whale Fishery	2,636,000
The Menhaden Fishery	2,117,000
The Alaska Fur Seal Fishery	1,541,000
The Mackerel Fishery	1,501,000
The Inland Lakes and Creek Fishery	1,500,000
The Shad and Alewife Fishery	1,500,000
The Herring and Sardine Fishery	1,130,000
The Clam and Quahog Fishery	1,014,000

B. Producing from $500,000 to $1,000,000.

The Great Lake Whitefish Fishery	$900,000
The Lobster Fishery	732,000
The Great Lakes General Fishery	600,000
The Shore Fishery of the Middle States	600,000
The Weir and Trap Fishery of New England	600,000
The Sea Otter Fishery	600,000

* These values are approximate estimates only, and are subject to revision.

C. PRODUCING $100,000 TO $500,000.

The Halibut Fishery	$447,000
The California Shore Fishery	370,000
The Crab Fishery	328,000
The Marine Salt Industry	306,000
The Winter Haddock Fishery	295,000
The Sturgeon Fisheries	237,000
The Mullet Fishery	225,000
The Shrimp and Prawn Fishery	209,000
The Sponge Fishery	201,000
The Eel Fishery	190,000
The Abalone Fishery	128,000
The Antarctic Seal and Sea Elephant Fishery	112,000
The Gulf Shore Fishery	

D. PRODUCING $15,000 TO $100,000.

The Hake Fishery	$90,000
The South Atlantic Shore Fishery	85,000
The Scallop Fishery	50,000
The New England Shore Fishery	50,000
The Red Snapper and Grouper Fishery	48,000
The Smelt Fishery	48,000
The Turtle and Terrapin Fishery	45,000
The Mussel Fishery	37,000
The Flounder Fishery	30,000
The Scallop Fishery	29,000
The Swordfish Fishery	28,000
The Eastern Salmon Fishery	22,000
The Seaweed Industry	19,000
The Irish Moss Industry	16,000

VII.

There are certain among the fisheries just enumerated which are peculiar to the United States, or are interesting to the people of Europe on account of special methods employed in their prosecution. Concerning these some detailed information will perhaps be acceptable.

The Oyster Industry.—The oyster fishery is the largest upon the list. It employs 52,805 persons, and yielded, in

1880, 22,195,370 bushels, worth to the producer $9,034,861. There is to be considered an enhancement on 13,047,922 bushels, in passing from producers to market. This enhancement, which amounts to $4,368,991, results either from replanting or from packing in tin cans, and increases the value of the products to $13,438,852. This fishery employs 4155 vessels, valued at $3,528,700, and 11,930 boats. The actual fishermen number 38,249, the shoresmen 14,556. About 80 per cent. of the total yield is obtained from the waters of Chesapeake Bay. A speedy extermination of this most valuable mollusk will doubtless result unless some effective means of protection and artificial culture are soon employed.

The following statistical summary shows the volume of the oyster industry of the whole country :—

TABLE showing, by STATES, the PERSONS EMPLOYED, CAPITAL INVESTED, and VALUE of PRODUCTS in the OYSTER INDUSTRY.

States.	Grand Total.			Persons Employed.		Apparatus and Capital.		
	Number of Persons employed.	Bushels of Oysters produced.	Value of Oysters as sold.	Fishermen.	Shoresmen.	Total capital invested in Oyster Industry.	Number of Vessels.	Value of Vessels.
Total	52,805	22,195,370	$13,438,852	38,249	14,556	$10,583,295	4,155	$3,528,700
Maine	15	. .	37,500[1]	5	10	4,210	1	3,000
New Hampshire	9	1,000	6,050	6	3	2,400	. .	. .
Massachusetts	896	36,000	405,550	409	487	303,175	56	227,000
Rhode Island	650	163,200	356,925	300	350	110,000	. .	. .
Connecticut	1,006	336,450	672,875	672	334	361,200	100	69,000
New York	2,724	1,043,300	1,577,050	1,958	766	1,013,060	426	397,000
New Jersey	2,917	1,975,000	2,080,625	2,605	312	1,057,000	575	530,000
Pennsylvania	. .	.	187,500[1]	. .	. .	. .	. .	. .

[1] This quantity represents only the enhancement, the first cost being included in the Maryland and Virginia statistics.

TABLE showing, by STATES, the PERSONS EMPLOYED, CAPITAL INVESTED, &c.—*continued.*

States.	Grand Total.			Persons Employed.		Apparatus and Capital.		
	Number of Persons Employed.	Bushels of Oysters Produced.	Value of Oysters as Sold.	Fishermen.	Shoresmen.	Total Capital Invested in Oyster Industry.	Number of Vessels.	Value of Vessels.
			Dollars.			Dollars.		Dollars.
Delaware . . .	1,065	300,000	687,725	820	245[1]	145,500	65	50,000
Maryland . . .	23,402	10,600,000	4,730,476	13,748	9,654[2]	6,034,350	1,450	1,750,000
Virginia	16,315	6,837,320	2,218,376	14,236	2,079[3]	1,351,100	1,317	460,950
North Carolina . .	1,020	170,000	60,000	1,000	20	68,500	90	22,500
South Carolina . .	185	50,000	20,000	175	10	12,250	10	2,500
Georgia	350	70,000	35,000	300	50	18,500	..	..
Florida	166	78,600	15,950	140	26	22,000	..	..
Alabama . . .	300	104,500	44,950	250	50	16,000	20	6,000
Mississippi . . .	60	25,000	10,000	50	10	3,000	..	..
Louisiana . . .	1,400	295,000	200,000	1,300	100	36,750	45	10,750
Texas	240	95,000	47,300	200	40	17,750	..	..
Washington Ter. .	85	15,000	45,000	75	10	6,550	..	..

[1] Of these, 215 are employed in the canneries at Seaford.
[2] Of these, 8,864 are employed in the various canneries.
[3] Of these, 1,578 are employed in the canneries.

TABLE SHOWING, by STATES, the PERSONS EMPLOYED, CAPITAL INVESTED, &c.—*continued.*

States.	Apparatus and Capital.				Products.		Enhancement of Value of Oysters in process of preparation for Market.[1]	
	Number of Boats.	Value of Boats.	Value of Gear and Outfit.	Value of Shore Property.	Bushels of Oysters produced.	Value of same to Producer.	Number of Bushels.	Amount of Enhancement.
Total . . .	11,930	$708,330	$712,515	$5,633,750	22,195,370	$9,034,861	13,047,922	$4,368,991
Maine	3	60	150	1,000	..	..	75,000	37,000
New Hampshire .	5	300	100	2,000	1,000	800	7,000	5,250
Massachusetts . .	117	9,485	10,690	56,000	36,000	41,800	514,000	363,750
Rhode Island . .	100	14,500	5,500	90,000	163,200	225,500	274,300	131,425
Connecticut . . .	563	33,165	19,385	239,650	336,450	386,625	515,000	286,250
New York . . .	1,714	121,700	42,460	451,900	1,043,300	1,043,300	1,065,000	533,750
New Jersey . . .	1,400	110,500	91,500	325,000	1,975,000	1,970,000	237,500	110,125
Pennsylvania . .	..	..	..	..	..	..	[4]250,000	137,500
Delaware . . .	300	12,000	10,000	[2]73,500	300,000	325,000	[5]834,500	362,725
Maryland . . .	1,825	130,520	161,480	[3]3,992,350	10,600,000	2,650,000	7,653,492	2,080,476
Virginia	4,481	224,050	329,250	[7]336,850	6,837,320	1,948,636	1,622,130	269,740
North Carolina . .	800	16,000	15,000	15,000	170,000	60,000	..	..
South Carolina . .	100	2,500	2,250	5,000	50,000	20,000	..	..
Georgia	100	10,000	3,500	5,000	70,000	35,000	..	..
Florida	110	8,000	2,000	12,000	78,600	15,950	..	..
Alabama . . .	42	4,000	3,000	3,000	104,500	44,950	..	..
Mississippi . . .	40	1,000	500	1,500	25,000	10,000	..	..
Louisiana . . .	120	3,000	13,000	10,000	295,000	200,000	..	..
Texas	70	6,750	2,000	9,000	95,000	47,300	..	..
Washington Ter. .	40	800	750	5,000	15,000	10,000	..	..

[1] This includes planting, bedding, fattening, and transportation to distant markets in oyster-vessels.
[2] Of this, 28,500 dollars is invested in the cannery interests at Seaford.
[3] Of this amount, 2,492,350 dollars represents the cash capital invested in the cannery industry.
[4] Brought in winter by vessels registered in other States, the men engaged and the value of the vessels being accounted for elsewhere.
[5] Of these, 184,500 bushels were packed at Seaford, and 650,000 bushels were planted in Delaware Bay.
[6] Of this, 22,225 dollars represents the enhancement on those canned.
[7] Of this, 119,350 dollars represents the cash capital in the cannery interests, and 167,500 dollars the value of buildings and fixtures for canning.

2. *The Pacific Salmon Industry.*—The Salmon fishery of the Pacific is another industry peculiar in its methods and extent. The Quinnat, or King Salmon (*Salmo quinnat*, = *Oncorhynchus chouicha*), also often called the California Salmon, is the principal object of capture, though other related species are also taken. As they ascend in the spring to their spawning beds, they are taken in gill-nets in immense numbers, also in revolving traps of great size and destructiveness. They are for the most part packed in tins, though many are smoked or pickled ; pickled salmon-belly is a favourite delicacy of the region. Though the capture is enormous, it has been demonstrated that the supply can easily be kept up by a small outlay in artificial culture. In 1880, 3370 fishermen, mostly Chinese, took 51,862,000 pounds ; full statistics are given in the appended table. The total value of the product in 1880, was $3,389,934. This industry has sprung into existence for the most part during the past decade.

TABLE SHOWING the NUMBER of SALMON FISHERIES and CANNERIES of the PACIFIC COAST; STATISTICS of FISHERMEN, BOATS, CAPITAL INVESTED in the FISHERIES and FIRST PRODUCTS of the SAME and of CANNERIES; CAPITAL INVESTED in CANNERIES; PRODUCT of the CANNERIES; NUMBER of FACTORY HANDS, with TOTALS of CAPITAL, PERSONS EMPLOYED, and VALUE of PRODUCT for the ENTIRE INDUSTRY.

Regions.	Fishermen.	Boats.		Nets.	Value of Boats and Apparatus.	Amount of Catch.		Amount Salted.		
	No.	No.	Value.	Value.		Number of Fish.	Weight in Pounds.	Pounds Fresh.	Pounds Salted.	Value.
Totals	3,370	1,715	$71,800	$71,800	$142,900	2,755,000	51,862,000	1,585,500	1,246,000	$22,600
Sacramento River, California .	500	[1]330	60,000	60,000	120,000	606,700	10,000,000	528,000	396,000	6,600
Smith and Eel Rivers, California Rogue River, Oregon, and vicinity	110	55	[2][8,000]	[2][9,000]	[2][17,000]	156,000	2,340,000	707,500	570,000	10,400
Columbia River	2,500	1,200	10,000 [2][232,000]	10,000 [2][232,000]	20,000 [2][464,000]	1,925,000	38,500,000	300,000	240,000	4,800
Puget Sound	10	5	800	800	1,600	23,300	350,000	50,000	40,000	800
Alaska	250	125	1,000	300	1,300	44,000	672,000	..	..	..

[1] Of which 100 are scows.

[2] Capital invested in fishery apparatus by the canneries and included in the aggregate capital of the canneries in a subsequent column.

Regions.	Amount Smoked.		Sold Fresh to San Francisco.		Consumed Locally or Unaccounted for.		Sold to Canneries.			Total to Fishermen.
	Pounds Fresh.	Value.	Pounds.	Value.	Pounds.	Value.	Number of Fish.	Pounds.	Value.	Amount.
Totals	200,000	$5,000	2,000,000	$60,000	4,696,958	$46,969	2,152,509	43,379,542	$909,818	$1,044,387
Sacramento River, California .	200,000	5,000	2,000,000	60,000	1,967,000	19,670	321,548	5,305,000	70,600	170,870
Smith and Eel Rivers, California Rogue River, Oregon, and vicinity	..	..	..	..	40,700	407	106,000	1,591,800	15,918	26,725
Columbia River	..	..	..	..	2,587,258	25,872	1,618,761	35,612,742	809,380	840,052
Puget Sound	..	..	..	..	102,000	1,020	39,000	198,000	1,560	3,380
Alaska	..	..	..	..	..	..	67,200	672,000	3,360	3,360

Regions.	Canneries.		Product of the Canneries.			Enhancement of Value of Salmon in Process of Canning.	Factory Hands.	Persons Employed.	Capital.	Value of Product.
	No.	Capital.	Cases.	Pounds in 1-lb. cans.	Value.		Average Number.	Total.	Total.	Total.
Totals	45	$1,239,000	655,274	31,453,152	$3,255,365	$2,345,547	4,940	8,310	$1,381,200	$3,389,934
Sacramento River, California .	10	100,000	80,387	3,858,576	400,935	321,335	800	1,300	220,000	492,205
Smith and Eel Rivers, California Rogue River, Oregon, and vicinity	3	25,000	22,300	1,070,400	111,500	95,582	95	205	25,000	122,307
Columbia River	29	1,100,000	539,587	25,900,175	2,697,930	1,888,550	4,000	6,500	1,120,000	2,728,602
Puget Sound	1	4,000	3,000	144,000	15,000	13,440	15	25	5,600	16,820
Alaska	2	10,000	10,000	480,800	30,000	26,640	30	280	10,600	30,000

The whale fishery has of late years greatly decreased in value, owing to the introduction of mineral oils, and the great diminution in the number of whales, due to over-fishing.

"The entire fleet in 1880 numbered 171 vessels, including 119 bark-rigged vessels, 7 ships, 9 brigs, and 46 schooners. The distribution of the fleet was as follows: Hudson Bay, 5 vessels; North and South Atlantic grounds, 111 vessels; Berring Strait, 25 vessels; Pacific Ocean, 22 vessels; in port throughout the year, 8 vessels.

"The value of the products of the whaling industry in 1880 was $2,636,322; the yield included 37,614 barrels of sperm oil and 34,626 barrels of whale oil, valued at $1,723,808; 458,400 pounds of whalebone, worth $907,049; and $5,465 worth of ambergris and walrus ivory. The Pacific Arctic Ocean grounds were the most productive, yielding oil and bone worth $1,249,990. From the Atlantic Ocean grounds oil and bone were taken worth $908,771.

"Besides the vessel fishery there is a boat or shore-whaling industry at Cape Cod, and in North Carolina, on the coasts of California, Washington Territory and Alaska. The principal species on the Atlantic coast is the finback, and on the Pacific the California gray whale. Humpback, sulphur bottom, and right whales, are occasionally taken in both oceans.

"The whale fishery of this country was in its zenith of prosperity about the middle of the present century, when the fleet numbered 736 vessels, aggregating 231,406 tons, the value being $10,766,521.

"The relative importance of the various whaling grounds," writes Mr. Clark, "during the past years, from 1870 to 1880, is shown by the following facts. Of the sperm-oil

landed during that period, 55 per cent. was taken in the North and South Atlantic Oceans, 33 per cent. in the Pacific, and 12 per cent. in the Indian Ocean. Of whale-oil, 58 per cent. came from the North Pacific and the Pacific fleets, 24 per cent. from the North and South Atlantic fleets, 10 per cent. from the South Pacific, 5 per cent. from the Indian Ocean, and 3 per cent. from Hudson Bay, Cumberland Inlet, and Davis Strait. Of the whale-bone secured in the same decade, 88 per cent. was from north of the fiftieth parallel in the North Pacific and Arctic Oceans, and 5 per cent. from Hudson Bay and Cumberland Inlet, and the balance from the Atlantic, Indian, and other oceans.

"The number of voyages undertaken by the fleet for 1870 to 1880 was 810, which includes Arctic whalers annually refitting at San Francisco and other ports. Of these voyages 382 were to the North and South Atlantic, 254 to the Pacific, Arctic, and adjacent grounds, 98 to the South Pacific, 45 to the Indian Ocean, and 36 to the Atlantic Arctic grounds, Hudson Bay, Davis Strait, and Cumberland Inlet."

Year.	Ships and Barks.	Brigs.	Schooners.	Total Vessels.	Total Tonnage.
1870 . . .	217	22	77	316	72,173
1871 . . .	214	18	48	280	67,909
1872 . . .	170	12	28	210	51,252
1873 . . .	151	12	28	191	46,230
1874 . . .	129	7	25	161	39,788
1875 . . .	118	8	26	152	36,230
1876 . . .	121	7	30	158	37,182
1877 . . .	120	8	34	162	36,476
1878 . . .	128	11	39	178	39,976
1879 . . .	123	12	42	177	39,391
1880 . . .	126	9	46	181	38,637

TABLE showing the VALUE of SPERM-OIL, WHALE-OIL, and WHALEBONE landed by the AMERICAN FLEET, the VALUE of the CONSUMPTION in the UNITED STATES, and the VALUE of the EXPORTATION ANNUALLY from 1870 to 1880.

Year.	Landed by the fleet.*	Consumption in the United States.	Exportation.
1870	$4,529,126	$2,896,883	$1,476,864
1871	3,691,469	2,798,408	1,479,153
1872	2,954,783	2,081,468	1,374,098
1873	2,962,106	1,947,037	929,247
1874	2,713,034	2,154,638	1,179,286
1875	3,314,800	1,700,823	1,494,727
1876	2,639,463	1,346,828	1,487,533
1877	2,309,569	1,113,681	924,175
1878	2,232,029	849,043	1,357,162
1879	2,056,069	1,345,582	582,994
1880	2,659,725	1,165,944	795,657

The Menhaden Fishery.—The commercial importance of the Menhaden (*Brevoortia tyrannus*) has but lately come into appreciation. Twenty-five years ago, and before, it was thought to be of very small value. A few millions were taken every year in Massachusetts Bay, Long Island Sound, and the inlets of New Jersey. A small portion of these were used for bait; a few barrels were occasionally salted in Massachusetts, to be exported into the West Indies. Large quantities were ploughed into the soil of the farms along the shores, stimulating the crops for a time, but in the end filling the soil with oil, parching it, and making it unfit for tillage. Since that time manifold uses have been found. As a bait fish this excels all others; for many years much the greatest share of our mackerel was caught by its aid, while the cod and halibut fleet use it rather than any other fish, when it can be procured. The total consumption of Menhaden for bait,

* From half a million to a million dollars' worth of products are carried over from year to year.

1877, did not fall below 80,000 barrels, or 26,000,000 of fish, valued at $500,000. Ten years before, when the entire mackerel fleet was fishing with hooks, the consumption was much greater. As a food resource it is found to have great possibilities. Many hundreds of barrels are sold in the West Indies, while thousands of barrels are salted down for domestic use by families living near the shore. In many sections they are sold fresh in the market. About 1872 there sprang up an important industry, which consists in packing these fish in oil, after the manner of sardines, for home and foreign consumption. In 1874 the production of canned fish did not fall below 500,000 boxes. This industry has now been discontinued, the herring proving to be better suited for canning. As a source of oil the Menhaden is of more importance than any other marine animal. Its annual yield usually exceeds that of the whale (from the American fisheries) by about 200,000 gallons, and, in 1874, did not fall far short of the aggregate of all the whale, seal, and cod oil made in America. In 1878 the Menhaden Oil and Guano Industry employed capital to the amount of $2,350,000, 3,337 men, 64 steamers, 279 sailing vessels, and consumed 777,000,000 of fish. There were 56 factories, which produced 1,392,644 gallons of oil, valued at $450,000, and 55,154 tons of crude guano, valued at $600,000; this was a poor year. In 1874 the number of gallons produced was 3,373,000; in 1875, 2,681,000; in 1876, 2,992,000; in 1877, 2,427,000. In 1878 the total value of manufactured products was $1,050,000; in 1874 this was $1,809,000; in 1875, $1,582,000; in 1876, $1,671,000; in 1877, $1,608,000; it should be stated that in these reports only four-fifths of the whole number of factories are included. The refuse of the oil factory supplies a material of much value for manures.

LE B.

HADEN I

State.	Number of Persons Employed	l Invested. Boat Number.
Total	3,635	648
Maine	..	..
Massachusetts . . .	271	57
Rhode Island . . .	608	111
Connecticut	631	114
New York	1,081	225
New Jersey	304	52
Maryland	21	4
Delaware	11	5
Virginia	708	80
North Carolina . . .	..	..

n sold to facto

As a base for nitrogen it enters largely into the composition of most of the manufactured fertilisers. The amount of nitrogen derived from this source in 1875 was estimated to be equivalent to that contained in 60,000,000 lbs. of Peruvian guano, the gold value of which would not have been far from $1,920,000. The yield of the Menhaden fishery in pounds is probably triple that of any other carried on by the fishermen of the United States. In 1880, with an increased value of products, the Menhaden fishery yielded $2,116,787. In the accompanying table, prepared by Mr. Howard Clark, detailed statistics are given. In estimating the importance of the Menhaden to the United States, it should be borne in mind that its absence from our waters would probably reduce all our other sea fisheries to at least one-fourth their present extent.

The Alaska Fur-Seal and Sea-Otter Industry.—The Seal-fishery has been discussed in Mr. Elliot's monograph recently published by the Census Office. This is in the main situated under the control of the Alaska Commercial Company from the Prybilov Islands of Alaska, where, in accordance with the terms of a lease which they have received from the Government of the United States, they are permitted to kill only 100,000 young males each year, thus securing a permanence of supply. The same company obtained 47,000 skins in addition from the Commander Islands, leased them by Russia. There are also 10,000 skins obtained by the shore fishermen of California, and 56,000 by American fishermen in Puget Sound. The total value of Fur Seal skins obtained by Americans on this coast is placed at $1,540,912.* The skins undergo an immense enhancement of value before leaving the hands of the Alaskan Commercial Company, which has establishments in London

* This estimate is subject to revision.

TABLE B.

STATISTICS OF THE MENHADEN INDUSTRY IN 1880.

State.	Grand Total.			Persons Employed.		Capital Invested.									Products.					
						Vessels.				Boats.		Purse-seines.								
	Number of Persons Employed.	Capital Invested.	Value of Products.	Fishermen.	Factory Hands.	Number.	Tons.	Value.	General Outfit exclusive of Net and Boat.	Number.	Value.	Number.	Value.	Value of Factories with Fixtures.	Pounds of Menhaden taken.	Gallons of Oil made.	Value of Oil.	Tons of Guano made.	Value of Guano.	Value of Menhaden Compost.
		Dollars.	Dollars.					Dollars.	Dollars.		Dollars.		Dollars.	Dollars.			Dollars.		Dollars.	Dollars.
Total	3,635	2,362,841	2,116,787	2,543	1,092	456	12,905·71	1,009,650	143,819	648	65,435	366	138,400	1,009,537	570,424,377	2,066,396	733,424	68,904	1,301,217	61,669
Maine	..	299,187	..	..	..	5	320·89	20,000	..	..	..	..	..	279,187	..	..	..	..	..	.
Massachusetts	271	179,105	61,769[1]	251	20	35	1,269·70	106,400	17,105	57	7,000	34	13,600	35,000	26,066,077	50,400	17,640	1,971	23,652	..
Rhode Island	608	304,300	221,748	416	192	61	2,188·58	171,050	24,600	111	10,750	50	20,000	77,900	68,693,800	270,482	94,668	10,590	127,080	..
Connecticut	631	392,370	256,205	504	127	72	2,304·76	191,950	27,600	114	11,820	55	22,000	139,000	65,092,000	256,300	89,705	9,000	166,500	..
New York	1,081	819,990	1,114,158	756	325	147	4,053·87	391,750	42,600	225	20,240	126	50,400	315,000	288,891,200	1,186,682	415,338	32,210	658,520	40,300
New Jersey	304	129,250	146,286	174	130	31	560·68	35,400	12,000	52	6,350	20	8,000	67,500	29,064,600	87,747	30,711	4,545	113,625	1,950
Maryland	21	12,775	11,851	15	6	3	71·20	2,900	1,200	4	275	1	400	8,000	3,903,000	10,575	3,701	300	6,200	1,950
Delaware	11	1,700	941	8	3	..	..	..	..	5	200	..	..	1,500[2]	499,900	450	157	15	180	604
Virginia	708	222,164	303,829	419	289	102	2,136·03	90,200	18,714	80	4,800	80	24,000	84,450	88,213,800	203,760	81,504	10,273	205,460	16,865
North Carolina	..	2,000	..	..	..	..	..	..	..	..	..	..	..	2,000	..	..	..	..	..	..

[1] Includes 20,477 dollars, the value of Menhaden sold to factories outside the State or used for bait.
[2] Includes value of haul-seines.

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where they are plucked and dyed. In the Exhibition may be seen a group of these Seals, and a series of interesting colour sketches by Elliott. According to Mr. Petrov, the yield of Sea-otter skins from Alaska in 1880 amounted to 6000, worth $600,000. In addition to these, 75, valued at $3,750, were taken in California.

The Mackerel Fishery.—The Mackerel fishery is one of the most important of the "general fisheries," and is of special interest from having been the chief element of discussion in connection with the Fishery Treaty between Great Britain and the United States, which is soon to come up for readjustment. Prior to 1870 a large fleet of New England vessels resorted to the Gulf of St. Lawrence for Mackerel; in 1882 only one Mackerel-schooner visited Canadian waters, returning with about 200 barrels of fish. This revolution in the Mackerel fishery is due to the introduction of the great purse seine, by which Mackerel are taken by the hundred, or even more, barrels at a time, in the broad ocean between Cape Hatteras and Cape Sable.

This fishery in 1880 employed 468 vessels and 5043 men, and produced 131,939,225 lbs. of fresh fish, of which 117,500,000 lbs., or 343,808 barrels were salted, the remainder being canned or sold fresh.

The Shad and Alewife Fisheries.—Each of our great rivers of the Atlantic coast, the St. Johns, the St. Mary's, the Altamaha, the Savannah, the Ogeechee, the Cape Fear, the Neuse, the York, the James, the Rappahannock, the Potomac, the Patuxent, the Susquehanna, the Delaware, the Hudson, the Housatonic, the Connecticut, the Merrimac, is in the spring or early summer the seat of a fishery of considerable importance, having for its object the capture of the anadromous fishes of the Herring family, which ascend the rivers to spawn at the approach of warm weather.

Seines and drift-nets take them in immense numbers, and for two or three months the entire surrounding country is feasting upon this cheap and luscious food. The product in 1880 was as follows :—

SHAD = *Clupea sapidissima.*

State.	Pounds.	Value.
Maine	580,318	$11,876
Massachusetts	164,524	8,226
Rhode Island	48,100	2,500*
Connecticut.	1,318,032	75,000*
New York	2,733,600	136,680
New Jersey	750,000	35,000
Pennsylvania	559,600	27,980
Delaware	1,050,000	52,500
Maryland	3,759,426	140,326
Virginia	3,171,953	134,496
North Carolina	3,221,263	329,569
South Carolina	207,600	12,432
Georgia	252,000	17,941
Florida	251,700	20,136
	18,068,116	$1,004,462

ALEWIVES = *C. vernalis, &c., aestivalis.*

State.	Pounds.	Value.
Maine	3,249,220	$38,823
New Hampshire	425,000	6,000*
Massachusetts	3,751,000	28,635
Rhode Island	140,000	2,000*
Connecticut	270,000	4,000*
New York	250,000	3,750
New Jersey	1,200,000	17,335
Delaware	1,800,000	26,000
Maryland	9,128,959	139,667
Virginia	6,925,413	76,300
North Carolina	15,520,000	142,784
South Carolina	400,000	9,000
Georgia	125,000	3,750
Florida	10,000	200
	43,194,651	$498,254

* Estimated.

The river fisheries of the southern and middle states are stated by Colonel McDonald to engage 13,017 persons, 78 vessels, and 4815 men; in the north the Shad and Alewife fisheries are chiefly carried on by fishermen engaged in other fisheries at other times in the year.

The Sardine and Herring Fishery.—The Sardine industry of Maine is similar to the Pacific Salmon industry, and of still more recent origin. Up to 1880, according to Mr. R. E. Earll, it was confined to Eastport, and though experiments were made in the preparation of Herrings as Sardines as early as 1866, the business did not practically begin till 1875, since which time it has grown with a remarkable rapidity. In 1880 it furnished employment to over 1,500 fishermen and factory hands, in addition to 376 fishermen belonging to New Brunswick. The capital dependent upon the industry during the same season, including $80,000 belonging to the New Brunswick fishermen, was over $480,000, and the value of the products amounted to nearly $825,000.

"Many of the larger Cape Ann vessels," writes Mr. Earll, "engage in the frozen-herring trade during the winter months, visiting points along the coasts of Maine, New Brunswick, and Newfoundland, where the herring chance to be most abundant, and bringing large trips to the principal New England markets. Formerly they supplied themselves with nets for catching their own fish, and took full crews of fishermen to assist in the work, but of late they find it cheaper to buy fish of the natives, in which case they carry only enough men to work the vessel on the passage. The herring are first frozen on the shore, after which they are thrown, with a little straw, into the hold, and at times even the cabin of the vessel is filled, the crew living in the forecastle. A vessel thus loaded carries

from 300,000 to 400,000 fish. About 95 cargoes, worth upwards of $100,000, are bought from the vicinity of Eastport alone; the herrings bought in the British provinces are not included in our statistics.

"In addition to the fish frozen or packed in sardine-cans, herring to the value of $150,000 are smoked, pickled, or sold for bait."

The Clam and Quahaug Fishery.—There are two important kinds of Clams—the Long Clam, or "Maninose," *Mya arenaria,* and the Quahaug, or Round Clam, sometimes called the Wampum Clam, *Venus mercenaria.* Of the former, we are told by Lieut. Winslow:—"Extensive beds occur at intervals along the coast of Maine, and the annual yield is estimated at nearly 316,000 bushels, valued at about $88,472.

"The Massachusetts fishery is the one of most consequence, and the next in point of importance is Narragansett Bay and the Rhode Island shores. While in Massachusetts Bay the profitable season is during the summer months, in Rhode Island the winter's fishing brings in the largest return; a large number of the inhabitants of the shores being engaged during that season in securing soft Clams. The whole coast of Long Island Sound is prolific, and one or two points are especially noted for the abundance, or superior size and quality of the Clams usually found. Guilford, on the Connecticut coast, is especially prominent, the Clams from that vicinity sometimes being 6 and 8 inches long, a pound or more in weight, and retailing in New Haven markets for $1.25 per dozen. These Clams are, however, only obtained at extremely low tides and are comparatively scarce. About 10,000 of the ordinary size are taken per annum, and are sold at from 40 to 60 cents per dozen. All along the southern shore of the sound are

prolific clamming grounds, the principal product of the fishery being shipped to New York. The south shore of the island, especially Rockaway Bay, also sends its quota to supply the New York market. New York and Newark Bays formerly supplied large numbers of soft Clams, but of late years those areas have ceased to yield anything of consequence. Along the Jersey coast the annual yield is about 70,000 bushels, valued at about $29,500.

"There is very little in the methods of taking this species that calls for peculiar apparatus or appliances. A spade and bucket are the usual implements at the present day, the use of the plow having been but local, and abandoned when the abundance of the crop decreased. It is still used by Mr. Hawley, but only in cultivating; he having instituted a system of cultivation on a scale of considerable magnitude. His method is, briefly, to plow long furrows in the flats, and lay his Clams in them, some 6 or 12 inches apart. Some five years or more are necessary before the crop is realised, but it then pays exceedingly well.

"While extensively eaten, the larger portion of the annual crop is utilised as bait by the cod and mackerel fishermen.

"The following is a summary of the annual product of the fishery, and its value :—

Total number of Clams (*Mya arenaria*) .	164,195,200
Total number of bushels.	835,974
Value per bushel (average)	$0·395
Total value annual product	$330,523·24

"The 'Quahaug,' or 'Round Clam,' *Venus mercenaria*, Linné, is found from Florida to Massachusetts Bay, and thence northward, though rare and local, to the Gulf of

Saint Lawrence. It is very common from Vineyard Sound southward.

"The 'Quahaug' fishery is very extensive, this bivalve being, next to the oyster, the most important on the coast; but the implements and methods are simple in the extreme. Many Clams are gathered by hand as they crawl on the flats; many more are taken with straight rakes, curved drag-rakes, and dredges. Oyster-tongs are also occasionally used.

"'Count' Clams, the largest size, bring the best prices, and in the neighbourhood of New York sell for $3 per barrel, wholesale. It takes 800 'counts' to make a barrel; and as 3 to 4 barrels, or 2,400 to 3,200 Clams, is a good day's catch, some idea of the productiveness of the New Jersey flats and coast is gained from the foregoing. Smaller sizes are sold at 60 cents or $1 per bushel, depending on the size, and some are taken so small that 2,000 are required to fill a barrel; these, when about one inch in diameter, are called 'tea-clams.' Another name is 'Little Neck,' derived originally from a neck of land on the north shore of Long Island, known as Little Neck, whose Clams had a superior flavour; but the demand for a young, small, and tender Clam which has sprung up of late years, and was supplied from the Little Neck stock, has caused dealers generally to apply the term 'Little Neck' to all small Clams. They are used principally for pickling.

"The fishery is not an expensive one, the whole outfit of the 'clammer' not requiring an expenditure of over $150, including boat, rake, and baskets, and the pursuit is naturally followed by the poorer class of people—men who are employed by the oyster-dealers in winter and are out of work during the summer. The principal depôts are New York and Philadelphia, but a large number of Clams

are consumed throughout the interior of the New England and Middle States, and every sea-board town sends its quota to supply the demand. To the southward of the Delaware and Chesapeake this consumption diminishes very fast, that of all the Southern States being estimated by Ingersoll at not more than 50,000 bushels, valued at $20,000.

The summary of the annual product and value of the "Quahaug" fish-fishery for the whole coast is:—

Number of Clams taken	326,245,800
Number of bushels	1,087,486
Value	$657,747

The Lobster Fishery.—"The Lobster fishery," writes Richard Rathbun, "began on the Massachusetts coast about the beginning of the present century, and on the Maine coast about 1840. It has rapidly developed to the present time. At first, Lobsters were frequently found near low-water mark. They rarely occur in such situations now, and the fishery is mainly carried on in depths of a few fathoms to twenty or thirty fathoms; but sometimes in depths of forty to sixty fathoms.

"The Lobster fishery is regularly carried on by means of wooden framework traps, or pots, generally constructed of common house-laths, baited with cheap or refuse fish, weighted with stones, and lowered and raised by means of a rope. The number of pots used by each fisherman varies in different localities, ranging all the way from eight or ten, to one hundred. The average number may be said to be about fifty or sixty. The pots are set either singly or attached together in trawls, the character of the bottom, abundance of lobsters, and custom, regulating this matter. When set trawl-fashion, the pots are fastened together in

strings of ten or a dozen, to fifty or sixty, at distances apart of fifteen to twenty fathoms, and have a long buoy line at each end.

"The principal Lobster markets of the country are Portland, Boston, and New York. Lobsters are in season during the entire year; but are much more abundant in the markets, and much more highly prized as food during the late spring, summer, and early fall.

"The canning of Lobsters in the United States is entirely confined to the coast of Maine; and most of the provincial canneries are controlled by American capital. Without its canning interests, the Maine Lobster fishery would lose much of its prestige, as the majority of the Lobsters canned are below the regulation size established by custom for the fresh markets. The market-smacks will seldom buy Lobsters measuring less than ten or ten and a half inches in length, and those under this size are sold to the canneries. The canning industry was first started about 1840, at Eastport, Maine; but several years elapsed before it was successfully introduced. In 1880, there were twenty-three canneries in Maine, with a total capital of $289,000, remaining open from about April 1 to August 1, and giving employment to about 650 factory hands and 2,000 fishermen. The quantity of fresh Lobsters used, amounted to about 9,500,000 pounds, valued at $95,000 to the fishermen. The value of the canned products was $238,000, an enhancement in value by the process of canning of $143,000. Seventeen provincial canneries are owned by Americans, as follows:—one each in Newfoundland, the Magdalen Islands, and Prince Edward Island, three in New Brunswick, and eleven in Nova Scotia. The total amount of capital invested in 1880, was $213,000; 10,000,000 pounds of fresh Lobsters were consumed that year, and the value of

the canned products was $246,000. These products are all exported to Europe and other foreign countries, none passing into the United States.

"The total catch of Lobsters on the Maine coast in 1880, amounted to 14,234,000 pounds, valued at $268,000, first cost, or fishermen's prices. The catch for Massachusetts was 4,315,000 pounds, valued at $158,000, and that of the entire coast of the several Lobster states, was 20,128,000 pounds, worth $483,000, first price. The quantity of Lobsters handled by the several large fresh markets during 1880 was as follows: Portland, 2,000,000 pounds; Boston, 3,637,000 pounds; New York, 2,500,000 pounds; a total of 8,137,000 pounds. The enhancement in value of these Lobsters in passing through the large markets was $105,000, making the total value of the Lobster products, as they entered the hands of the smaller wholesale and the retail dealers, $732,000."

The Halibut Fishery.—There are several special fisheries of great interest carried on from certain parts of New England. The Halibut fishery is peculiar to Gloucester. The fresh Halibut fishery employs, winter and summer, a fleet of about thirty of the staunchest and swiftest schooners of eighty to one hundred tons, manned by crews of men whose seamanship and daring cannot be surpassed. The fishery is extremely perilous, being prosecuted on the outer banks in water from 1,200 to 1,800 feet in depth. Voyages continue three to seven weeks. The fish are brought to market in ice, and distributed almost over the entire continent.

The so-called salt Halibut fishery is prosecuted by a number of Gloucester fishery-factors, who send every summer a number of schooners to the Grand Bank of Newfoundland, and often a few into Davis' Straits. These vessels salt down in their holds the Halibut which

they obtain, and on their return it is smoked, producing smoked Halibut of the choicest kind—the so-called "bank-halibut."

The Crab Fishery.—"Over twenty species of Crabs belonging to the coasts of the United States are now regarded," writes Rathbun, "as of greater or less practical importance to mankind. The most valuable of these are the Blue Crab (*Callinectes hastatus*), Lady Crab (*Platyonichus ocellatus*), Stone Crab (*Menippe mercenarius*), and Rock Crabs (*Cancer irroratus* and *C. borealis*), of the east coast, and the Common Crab, Rock Crab, and Red Crab (*Cancer magister*, *C. antennarius*, and *C. productus*), of the Pacific Coast. The remaining species are utilized simply as bait, or to a slight extent only as food.

"The Blue Crab is the common edible Crab of the Atlantic Coast, and ranges from Massachusetts Bay to the Gulf of Mexico. The season for its fishery is of variable duration on different parts of the coast. At New York it lasts from May to October, while in Florida it begins as early as March and continues until December, or, if the weather be mild, through the entire winter. This Crab is eaten in both the hard and soft shell condition, but is greatly preferred, and commands a much higher price, when in the latter state. Soft-shell Crabs are, however, seldom taken in marketable quantities excepting on the New Jersey coast, whence New York derives the greater part of its supplies. The Crab fishery for New Jersey alone amounted to over $160,000, in 1880.

"Several different appliances are used in the capture of Blue Crabs, the most common being the ordinary scoop or dip net, also called crab-net. For attracting the Crabs from depths not easily reached by means of the dip-net, the fishermen resort to baited lines, without hooks, which

are used singly or made up into trawls 250 to 700 feet in length. Seines, hoop-nets, baited with meat, and clam-tongs are also occasionally employed for catching Crabs. As the Soft Crabs remain in a semidormant condition, and will not take the bait, they are secured almost entirely by means of scoop-nets from the beaches, or in the hands. Floating cars are extensively employed in some localities, for keeping the Hard Crabs until they shall have cast their shells and become soft. Crabs are generally shipped to market in boxes, baskets, or barrels, with or without packing. Small boxes are mainly preferred for the Soft Crabs, which are packed in very snugly in order that they may stand transportation without injury, and so that the moisture will not run too freely from the gills. The Crab catchers consist largely of women and children, especially in the Southern States.

"In 1880, there were three Crab canneries in the United States, two being located at Hampton, Virginia, and one at Oxford, Maryland.

"The Crab fisheries of the eastern coast of the United States, in 1880, amounted to $328,000 (fishermen's prices), of which the greater part belonged to New York, New Jersey, Delaware, Maryland, and Virginia. South of Virginia, on the Atlantic coast, the Crab fishery is of but slight importance at present; on the Gulf coast it amounts to about $10,000 annually, and is mainly confined to Louisiana."

The Winter Haddock Fishery. — The winter Haddock fishery of Gloucester is almost as perilous as the winter Halibut fishery. In it were employed, in 1880, seventy-seven of the best vessels engaged in summer in the cod and mackerel fisheries. About 45,000,000 Haddocks are annually caught on the New England coast.

The Sponge Fishery.—The American Sponge fishery is now a well-established industry of considerable importance, and gives employment to a large fishing fleet. Professor Alpheus Hyatt, one of the most recent writers on American Sponges, regards most of the American commercial forms as identical specifically with the Mediterranean, but separates them on subspecific differences. The same subspecies belong to both Florida and the Bahama Islands, but fewer commercial grades are recognised from the former than from the latter region. The finest quality of American Sponge is the Sheepswool, which now commands a higher price than those from the Bahamas. I quote again from Mr. Rathbun :

"The Florida Sponge grounds form three separate elongate stretches, along the southern and western coasts of the state. The first includes nearly all of the Florida Keys ; the second extends from Anclote Keys to Cedar Keys ; and the third from just north of Cedar Keys to Saint Mark's, in Apalachee Bay. The linear extent of these grounds is about 120 miles, and their breadth varies from a few miles to 15 or 20 miles. The total area of the Sponge grounds worked in 1880 was reckoned at about 3,000 square geographical miles, but this does not by any means cover the possibilities of the coast, as many additional sponging areas have been discovered since then. Key West is the principal headquarters for the Sponge fleet. The Florida Sponge fishery differs from the Mediterranean in that no divers are employed. The Sponge fleet consists of over 100 vessels, ranging in size from 5 to 50 tons burden.

"The cruises last from four to eight weeks, at the end of which time the vessels return to Key West, a few only going to Apalachicola. The process of bleaching or liming

Sponges has been extensively in vogue at Key West, but it is now meeting with much discouragement from the trade, for while it renders the Sponge much lighter in colour, it also partly destroys its fibre, and makes it less tough and durable. The Florida Sponges are all shipped from Key West and Apalachicola to New York. The value of the Florida Sponge fishery to the fishermen averages about $200,000 annually.

"The Florida Sponge fishery originated about 1852, for, although the occurrence of Sponges on the Florida reefs was previously made known, the species were not supposed to be of commercial value. The industry has gradually developed to the present time, but during the past few years has remained at about the same standing. The demand for the better grades greatly exceeds the supply. Fully 75 per cent. in value of all the Florida Sponges marketed are of the Sheepswool variety."

The Swordfish Fishery.—The Swordfish fishery is carried on from New Bedford, New London, and several smaller ports of southern New England. About 15 small vessels are employed in summer, and the yield of their harpoons, together with that from the mackerel vessels, amounts to about 1,500,000 pounds.

VII.

I have been asked to describe somewhat fully the aims, methods and achievements of the United States Fish Commission.

On the 9th of February, 1871, Congress passed a joint resolution which authorized the appointment of a Commissioner of Fish and Fisheries. The duties of the Commissioner were thus defined: "To prosecute investigations

on the subject (of the diminution of valuable fishes) with the view of ascertaining whether any and what diminution in the number of the food-fishes of the coast and the lakes of the United States has taken place; and, if so, to what causes the same is due; and also whether any and what protection, prohibitory or precautionary measures should be adopted in the premises, and to report upon the same to Congress."

The resolution establishing the office of Commissioner of Fisheries required that the person to be appointed should be a civil officer of the Government, of proved scientific and practical acquaintance with the fishes of the coast, to serve without additional salary. The choice was thus practically limited to a single man for whom, in fact, the office had been created. Professor Spencer F. Baird was appointed and entered at once upon his duties.

I think I may say without fear of challenge that very much of the improvement in the condition of our fisheries has been due to the wise and energetic management of our Commissioner. Himself an eminent man of science, for forty years in the front rank of biological investigation, the author of several hundred scientific memoirs, no one could realise more thoroughly the importance of a scientific foundation for the proposed work.

His position as the head of that most influential scientific organisation, the Smithsonian Institution, given by an Englishman to the United States "for the increase and diffusion of useful knowledge among men," enabled him to secure at once the aid of a body of trained specialists.

Pure and applied science have laboured together always in the service of the Fish Commission, their representatives working side by side in the same laboratories; indeed, much of the best work both in the investigation of the

fisheries and in the artificial culture of fishes has been performed by men eminent as zoologists.

The principal activity of the Commissioner, however, has been directed to the wholesale replenishment of our depleted waters. The success of fish culture is well recognised in the United States, but it was especially gratifying to its advocates that in 1880 the Grand Prize of the International Fisheries Exhibition at Berlin was awarded to Professor Baird as "the first fish-culturist in the world."

The work of the Commission is naturally divided into three sections:—

1. The systematic investigation of the waters of the United States and the biological and physical problems which they present. The scientific studies of the Commission are based upon a liberal and philosophical interpretation of the law. In making his original plans the Commissioner insisted that to study only the food-fishes would be of little importance, and that useful conclusions must needs rest upon a broad foundation of investigations purely scientific in character. The life history of species of economic value should be understood from beginning to end, but no less requisite is it to know the histories of the animals and plants upon which they feed or upon which their food is nourished; the histories of their enemies and friends, and the friends and foes of their enemies and friends as well as the currents, temperatures and other physical phenomena of the waters in relation to migration, reproduction and growth. A necessary accompaniment to this division is the amassing of material for research to be stored in the National and other museums for future use.

2. The investigation of the methods of fisheries, past and present, and the statistics of production and commerce of

fishery products. Man being one of the chief destroyers of fish, his influence upon their abundance must be studied. Fishery methods and apparatus must be examined and compared with those of other lands, that the use of those which threaten the destruction of useful fishes may be discouraged, and that those which are inefficient may be replaced by others more serviceable. Statistics of industry and trade must be secured for the use of Congress in making treaties or imposing tariffs, to show to producers the best markets, and to consumers where and with what their needs may be supplied.

3. The introduction and multiplication of useful food fishes throughout the country, especially in waters under the jurisdiction of the general government, or those common to several states, none of which might feel willing to make expenditures for the benefit of the others. This work, which was not contemplated when the Commission was established, was first undertaken at the instance of the American Fish Cultural Association, whose representatives induced Congress to make a special appropriation for the purpose. This appropriation has since been renewed every year on an increasingly bountiful scale, and the propagation of fish is at present by far the most extensive branch of the work of the Commission, both in respect to number of men employed and quantity of money expended.

VIII.

The origin of the Commission, its purposes, and methods of organization, having been described, it now remains to review the accomplished results of its work. In many departments, especially that of direct research, most efficient services have been rendered by volunteers; in fact,

a large share of what has been accomplished in biological and physical exploration is the result of unpaid labour on the part of some of the most skilful American specialists. Although I should be glad to review the peculiar features of the work of each investigator, the limits of this paper will not allow me even to mention them by name.

Since the important sea fisheries are located along the North Atlantic, the coast of this district has been the seat of the most active operations in marine research. For twelve years the Commissioner, with a party of specialists, has devoted the summer season to work at the shore, at various stations along the coast, from North Carolina to Nova Scotia.

A suitable place having been selected, a temporary laboratory is fitted up with the necessary appliances for collection and study. In this are placed from ten to twenty tables, each occupied by an investigator, either an officer of the Commission or a volunteer.

The regular routine of operations at a summer station includes all the various forms of activity known to naturalists—collecting along the shore, seining upon the beaches, setting traps for animals not otherwise to be obtained, and scraping with dredge and trawl the bottom of the sea, at depths as great as can be reached by a steamer in a trip of three days. In the laboratory are carried on the usual structural and systematic studies ; the preparation of museum specimens and of reports.

The permanent head-quarters are located at Wood's Holl, Massachusetts, where wharves are being built for the accommodation of the fleet of the Commission, and a house for use as scientific and fish-cultural laboratories, and where the propagation of sea-fishes will be continued on a larger scale than heretofore.

In addition to what has been done at the summer station, more or less exhaustive investigations have been carried on by smaller parties in every important position of the coast and interior waters.

For several years steamers were lent for the work by the Secretary of the Navy and the Coast Survey and Revenue Services.

In 1880, however, a steamer of 450 tons, the *Fish Hawk*, was built for the Commission. This being needed for fish-hatching purposes, another larger steamer, of 1000 tons, the *Albatross*, has just been built and put into commission. She has already, since April, made two successful deep-sea explorations, and has been supplied with every means for work of this kind.

The general practical results of this part of the work cannot be satisfactorily summed up on account of the number of important investigations still in progress.

One of the important features of the work has been the preparation of life histories of the principal fishes, great quantities of material having been accumulated relating to almost every species. A portion of this has been published, biographical monographs having been published on the bluefish, the scup, the menhaden, the salmon, the whitefish, the shad, the mackerel, the swordfish ; and others are being printed.

Similar monographs upon the lobster, oyster, and other invertebrates are also ready.

In connection with the work of fish culture much attention has been paid to embryology. The breeding times and habits of nearly all of our fishes have been studied, and their relations to water temperatures. The embryological history of a number of species, such as the cod, shad, alewife, salmon, smelt, Spanish mackerel, striped

bass, white perch, the silver gars, the clam and the oyster, have been obtained under the auspices of the Commission.

Many other problems have been worked out by specialists for the Commission, the details of which are described in the reports. One of these, for instance, has been the determination of the cause of the reddening of salt codfish, so injurious to commerce. Prof. Farlow found this to be due to the presence of a species of alga in the kind of salt in common use, and gave instructions by which the plague has been greatly lessened.

An investigation into the chemical composition and nutritive value of fish as compared with other food is still in progress, and all American food fishes are being analysed by Professor Atwater.

The temperature of the water, in its relation to the movements of fish, has from the first received special attention. Observations are made regularly during the summer work, and at the various hatching stations. At the instance of the Commissioner, an extensive series of observations have for several years been made under the direction of the chief signal officer of the army, at lighthouses, lightships, life-saving and signal stations, carefully chosen, along the whole coast. A number of fishing schooners and steamers have kept similar records. One practical result of the study of these observations has been the demonstration of the cause of the failure of the menhaden fisheries on the coast of Maine in 1879—a failure on account of which nearly 2000 persons were thrown out of employment.

A most remarkable series of contributions have been received from the fishermen of Cape Ann. When the Fish Commission had its head-quarters at Gloucester, in 1878, a general interest in the zoological work sprang up among the crews of the fishing vessels, and since that time they

have been vying with each other in efforts to find new animals. Their activity has been stimulated by the publication of lists of their donations in the local papers; and the number of separate lots of specimens received, to the present time, exceeds eight hundred. Many of these lots are large, consisting of collecting-tanks full of alcoholic specimens. At least thirty fishing vessels were carrying collecting-tanks on every trip, until it became necessary to recal them because no more specimens were required, and many of the fishermen, with characteristic superstition, had the idea that it ensured good luck to have a tank on board, and would not go to sea without one. The number of specimens acquired in this manner is at least 50,000 or 60,000, most of them belonging to species unattainable. Each halibut vessel sets, once or twice daily, lines from ten to fourteen miles in length, with hooks upon them fifteen feet apart, in water 1200 to 1800 feet in depth, and the quantity of living forms brought up in this manner, and which had never hitherto been saved, is very astonishing. Over thirty species of fishes have thus been added to the fauna of North America, and Professor Verrill informs me that the number of new and extra limital forms thus placed upon the list of invertebrates cannot be less than fifty.

The investigation of the statistics and history of the fisheries has perhaps assumed greater proportions than was at first contemplated. One of the immediate causes of the establishment of the Commission was the dissension between the line and net fishermen of Southern New England with reference to laws for the protection of the deteriorating fisheries of that region. The first work of Prof. Baird, as Commissioner, was to investigate the causes of this deterioration.

Each year increasing attention has been paid to this

subject. The Commissioner has never advised any legislation on the part of the general government, each state government having control over the fisheries in its own waters. Certain general conclusions concerning the effect of the fisheries upon the abundance of aquatic animals, seems to meet with general acceptance in the United States.

The important distinction between *the extermination of a species*, even in a restricted locality, and *the destruction of a fishery*, should be noticed. The former is somewhat unusual, and seemingly impossible in the case of oceanic species, while the latter, especially for limited regions, is almost of yearly occurrence.

1. Aquatic mammals like seals may be entirely exterminated, especially when, like the fur-seals, they forsake the water and occupy the land for breeding purposes. The fur-seals of our Pacific coast are nearly gone, except upon the Prybilov Islands of Alaska, where they are protected by the general government, the islands being leased to a company, who are allowed to kill only 100,000 each year, these being non-breeding males, and the permanence of this fishery thus being perfectly secured.

2. Aquatic mammals which do not leave the water, such as whales and manatees, conspicuous on account of their size, and not capable of rapid multiplication, may be practically exterminated when they breed near the shore. As examples, may be cited the cases of the Arctic sea-cow of the North Pacific, *Rhytina Stelleri*, and the Pacific gray-whale, or devil-fish, *Rhachianectes glaucus*, the tale of whose destruction in the lagoons of California may be found in Scammon's 'Marine Mammals of the Pacific Coast.'

3. In the case of fixed animals like the sponge, the

mussel, the clam, and the oyster, the colonies or beds may be practically exterminated, exactly as a forest may be cut down. The destruction of the oyster-beds of Pocomoke Sound, in Maryland, a large estuary, formerly very productive, is an example—the destruction being due more directly to the choking of the beds by the rubbish raked over them by the dredges, and the destruction of the ledges suitable for the reception of the young spat, than to the removal of all the adult oysters, which was, of course, never effected.

The preservation of the oyster-beds is a matter of vital importance to the United States, for oyster-fishing, unsupported by oyster-culture, will, within a short period, destroy the employment of tens of thousands and the cheap and favourite food of tens of millions of our people.

Something may be effected by laws which allow each bed to rest for a period of years after each season of fishing upon it. It is the general belief, however, that shell-fish-beds must be cultivated as carefully as garden-beds, and that this can only be done by leasing them to individuals. This is already the practice in the Northern States, where oysters are planted in new localities; there is difficulty however, in carrying out this policy in the case of natural beds, to which the fishermen have had continued access for centuries. It is probable that the present unregulated methods will prevail until the dredging of the natural beds come to be remunerative, and that the oyster industry will then be transferred from the improvident fishermen to the care-taking oyster-culturists, with a corresponding increase in price and decrease in consumption.

4. Fishes in ponds, lakes or streams are quickly exterminated unless the young fish are protected, the spawning season is undisturbed, and wholesale methods of capture

are prohibited. Many of our older states now have excellent laws for the preservation of game and fish, which are enforced, not by fishery wardens, but by the agency of societies and anglers' clubs, whose members are expected to prosecute offenders against the public interest.

5. A river may quickly be emptied of its anadromous fishes, salmon, shad, and alewives, by over-fishing in the spawning-season, as well as by dams which cut off the fish from their spawning-grounds. Examples of this may be found in dozens of American rivers.

In the same way, sea-fishes approaching the coasts to spawn upon the shoals or in the bays may be embarrassed, and the numbers of each school decimated, particularly if, as in the case of the herring, the eggs are adhesive and heavy.

Sea fishes spawning in the estuaries are affected by wholesale capture with stake nets, much in the same manner, though in a less degree, than salmon in the rivers. An example is apparently found in the temporary depression in the scuppaug or porgy fishery of Narragansett Bay.

Our shad and alewife fisheries are protected by an economic code of laws, different in the different states, and in the different rivers of each state. The most satisfactory laws are those which regulate the dates at which fishing must begin and close, and prescribe at least one day in the week, usually Sunday, in which the ascent of the fish must not be interrupted.

Massachusetts regulates its stake-net fisheries along the coast in a similar manner.

Migratory, semi-migratory, or wandering fishes, ranging in schools or singly over broad stretches of ocean, mackerel, herring, menhaden, blue-fish, bonito or squeteague, are apparently beyond the influence of human agency, espe-

cially since they spawn at a distance from the coast, or since the adults, when about to spawn, cannot be reached by any kind of fishery apparatus. Their fecundity is beyond comprehension, and in many instances their eggs float free near the surface, and are quickly disseminated over broad areas. The conclusions gained by Professor Baird tally exactly with those of Professor Huxley, that the number of any one kind of oceanic fish killed by man is perfectly insignificant when compared with the destruction effected by their natural enemies.

Their movements are no more to be anticipated than those of the atmosphere ; and in many instances, with no intelligible cause, some of the most abundant species, the blue-fish, the chub-mackerel, the little tunny, the scuppang, and the bonito, have absented themselves for considerable periods of years.

The chart showing the history of the mackerel fishery for the past eighty years, hanging in the American court, is an illustration of this statement. The variations in abundance cannot be explained by any facts in our possession ; and the yield in 1882 was greater than ever before, notwithstanding the fact that the fisheries of the past ten years have been prosecuted with unusual vigour. The remarkable change in the habitat of the menhaden, occurring in 1880, and promising to be permanent, was certainly not the effect of over-fishing, though fifteen years ago it would have been regarded as such. When the production of a region falls in two successive summers from 617,000 to 550 barrels, it is evident that nature, not man, is the cause.

The variations in the abundance of cod and haddock along the coast and on the banks within the last half century have been equally inexplicable.

Almost any piece of water, be it a bay or sound, or be it

the covering of a ledge or shoal at sea, may be over-fished to such a degree that fishing becomes unprofitable, especially if fishing be carried on in the spawning season. This statement refers, of course, only to the fishes which feed near the bottom. A familiar example is the abandonment of Massachusetts Bay by the halibut, and the extension of the fishery into very deep water.

Protection to the local fishermen may therefore require the regulation by law of definite fishing-grounds near the coast. There can be no doubt that the extensive fisheries prosecuted by menhaden steamers in the Gulf of Maine were prejudicial to the shore fishermen by driving the fish they formerly caught for bait out to sea and beyond the reach of their nets. There is also reason to believe that our great purse-seine fisheries for menhaden and mackerel, though perhaps not causing a decrease in the numbers of the fish, have kept them farther from the shore. There is a decided disposition on the part of the most intelligent men engaged in these fisheries to press the passage of a law which should prevent the use of the purse-seine before the first of June.

It has been stated that no legislative action has ever been recommended by the Commissioner of Fisheries. The statutes of the various states contain numerous laws for the protection of fish and fishermen, generally worse than useless, though there are many definitions of close time, which appear to be beneficial. To enforce these laws would, however, render necessary a large force of fish-wardens.

The policy of the United States Commissioner has been to carry out the idea that it is better to expend a small amount of public money in making fish so abundant that they can be caught without restriction and serve as cheap food for the people at large, rather than to expend a much

larger amount in preventing the people from catching the few that still remain after generations of improvidence.

The proper function of *public fish culture* is the stocking of the public waters with fish in which no individual can claim the right of property. This is being done in our rivers, with salmon, shad, and alewives, and in our lakes with whitefish.

Public fish culture is only useful when conducted upon a gigantic scale—its statistical tables must be footed up in tens of millions. To count young fish by the thousand is the task of the private propagator.

The use of steamships and steam machinery; the construction of refrigerating transportation cars, two of which, with a corps of trained experts, are constantly employed by the Commissioners, moving fish and eggs from Maine to Texas, and from Maryland to California, and the maintenance of permanent hatching stations, 17 in number, in different parts of the continent, are forms of activity only attainable by government aid.

Equally unattainable by private effort would be the enormous experiments in transplanting and acclimatising fish in new waters; California salmon in the rivers of the east; land-locked salmon and smelt in the lakes of the interior; such as the planting of shad in California and the Mississippi Valley; and German carp in ten thousand separate bodies of water in almost every state in the union: the two last-named experiments, carried out within a period of three years, is a success beyond doubt, and of the greatest importance to the country; the others have been more or less successful, though their results are not yet fully realised.

It has been demonstrated, however, beyond possibility of challenge, that our great river fisheries, producing in 1880,

48,000,000 pounds of alewives, 18,000,000 pounds of shad, 52,000,000 pounds of salmon, besides bass, sturgeon, and smelt, and worth "at first hands," between 4,000,000 and 6,000,000 of dollars, are entirely under the control of the fish culturist to sustain or to destroy, and capable of immense extension.

The same is true of the *Coregonus* fisheries of the Great Lakes, and there is every reason to believe, from experiments in part completed, that the dominion of fish culture may be extended in like manner for certain of the great sea productions, such as the cod, haddock, herring, mackerel, and Spanish mackerel fisheries.

The immense influence upon the sea fisheries of the maintenance of the abundance of anadromous fish in the rivers has already been indicated.

I am indebted to Mr. Earll for the following statistics of the work of the United States Commission :—

"As the operations of the Commission have increased, and the propagation of additional species has been undertaken, it has been found desirable to increase the number of hatching stations. These are of two kinds, known as collecting and distributing stations. The former are located near the spawning grounds of those species for which they are especially intended. The eggs are secured at these stations, and enough having been reserved to stock the waters of that region, the remainder are sent to distributing stations, usually located at some central point, to be hatched and shipped to the waters for which they are intended."

The following is a list of the hatching-stations operated by the United States Fish Commission in 1883 :—

1. Grand Lake Stream, Maine, station for collecting

eggs of the Schoodic salmon (*Salmo salar* var. *sebago*).

2. Bucksport, Me., station for collecting and hatching eggs of the Atlantic salmon (*Salmo salar*), and for hatching eggs of white-fish (*Coregonus clupeiformis*) to be distributed in the waters of the State.
3. Wood's Holl, Mass. Permanent coast-station, which serves as a base of operations for the scientific investigations of the Commission, and as a hatching station for eggs of the cod (*Gadus morrhua*) and other sea-fishes.
4. Cold Springs Harbour, Long Island, New York. Station for hatching eggs of various species of salmonidæ for distribution in New York and vicinity.
5. Havre de Grace, Maryland. Station located on Battery Island, in the Susquehanna River, for the purpose of collecting and hatching eggs of the shad (*Clupea sapidissima*).
6. Washington, District of Columbia.
    a. National Carp ponds. Ponds for the propagation of the three varieties of the carp (*Cyprinus carpio*), and the goldfish (*Carassius auratus*), the golden ide (*Idus melanotus* var. *auratus*), and the tench (*Tinca vulgaris*).
    b. Arsenal ponds. Ponds for the propagation of carp (*Cyprinus carpio*).
    c. Navy Yard. Station for collecting and hatching eggs of the shad (*Clupea sapidissima*).
    d. Central hatching station. A station fully equipped for scientific experiments connected with the propagation of fishes. The station is also provided with apparatus for hatching

the eggs of all of the more important species, including light, heavy, and adhesive eggs. It is the principal distributing station of the Fish Commission, for both eggs and young fish, to all portions of the United States.

7. Wytheville, Virginia. A station for hatching eggs of brook-trout (*Salvelinus fontinalis*) and California trout (*Salmo irideus*).

8. Saint Jerome's Creek, Point Lookout, Maryland. A station for the artificial propagation of the oyster (*Ostrea virginiana*), the Spanish mackerel (*Scomberomorus maculatus*), and the bandy porgy (*Chætodipterus faber*).

9. Avoca, North Carolina. A station on Albemarle Sound, at the junction of Roanoke and Chowan Rivers, for collecting, hatching, and distributing eggs of the shad (*Clupea sapidissima*), alewife (*Clupea vernalis* and *æstivalis*), and striped bass (*Roccus saxatilis*).

10. Northville, Michigan. A hatching station for the development and distribution of eggs of the white-fish (*Coregonus clupeiformis*). This station is also provided with tanks and ponds for the spawning, hatching, and rearing of brook-trout (*Salvelinus fontinalis*) and California trout (*Salmo irideus*).

11. Alpena, Michigan. A station for the collection and development of the eggs of the white-fish (*Coregonus clupeiformis*).

12. Baird, California.

a. Salmon station. A station on the McCloud River for the development and distribution of eggs of the California salmon (*Oncorhynchus chouicha*).

b. Trout ponds. A station near Baird, for collecting, developing, and distributing eggs of the California trout (*Salmo irideus*).

13. Clackamas River, Oregon. A station on Columbia River for collecting and hatching eggs of the California salmon (*Oncorhynchus chouicha*).

"It is impossible from the data at hand to give detailed statistics of the work done at all of the stations above mentioned; a statement of the operations of three or four of the larger ones must therefore suffice.

"The hatchery at Northville, Michigan, under the direction of Mr. Frank N. Clark, passed into the hands of the United States Fish Commission in 1880, and is now one of the most important stations for salmonidæ in the world. It is provided with natural and artificial ponds in which brook-trout, rainbow-trout, land-locked salmon and lake-trout, are kept for breeding purposes. In addition to the eggs obtained from these ponds, many millions of eggs of the white-fish, lake-trout, and wall-eyed pike are obtained in the waters of Lake Erie, and forwarded to Northville to be hatched and distributed. During the season of 1882-3, 70,950,000 eggs of the salmonidæ were handled at this hatchery, a large percentage of which were hatched and distributed to different waters. A large refrigerator is being put in in readiness for next season's work, when it is expected that fully 500,000,000 eggs of the white-fish alone will be hatched.

"The hatcheries at Bucksport and Grand Lake Stream are both under the superintendence of Mr. Charles G. Atkins. The former of these is provided with ponds in which salmon, purchased from the fishermen of the Penobscot River, in May, are confined till November, at which time

the eggs are taken and the fish liberated. At Grand Lake Stream, where the land-locked salmon is hatched, the eggs are obtained from the native fish which, when attempting to ascend to their natural spawning grounds, are turned aside into enclosures of netting, where they are retained until all of the eggs have been secured. There were secured at these two stations, during the past season, 3,675,000 eggs of these species for distribution to different parts of the United States.

"The hatchery on the McCloud River in California was established in 1872, under the superintendence of Mr. Livingston Stone, who has secured large quantities of eggs of the California salmon annually. The eggs have been taken from the wild salmon, which have been prevented from ascending to their natural spawning grounds by a dam which he has caused to be thrown across the river just above the hatchery. Eggs of the rainbow-trout also have been secured in considerable numbers.

"Owing to the lateness of the appropriation, little was done at the hatchery last year, only 4,000,000 salmon and 337,500 trout-eggs being secured. Most of these were hatched and planted in the waters of the Sacramento River. Mr. Stone gives the following comprehensive statement of the work accomplished since the establishment of the hatchery.

"In the eleven years since the salmon-breeding station has been in operation, 67,000,000 eggs have been taken, most of which have been distributed in the various States of the Union. Several million, however, have been sent to foreign countries, including Germany, France, Great Britain, Denmark, Russia, Belgium, Holland, Canada, New Zealand, Australia, and the Sandwich Islands.

"About 15,000,000 have been hatched at the station, and

the young fish placed in the McCloud and other tributaries of the Sacramento River. So great have been the benefits of this restocking of the Sacramento that the statistics of the salmon fisheries on the Sacramento show that the annual salmon catch of the river has increased 5,000,000 pounds during the last few years.

"The shad stations at Washington, D. C., and Havre De Grace, Maryland, have been recently enlarged, and are now capable of holding immense numbers of eggs. At one of the Washington stations alone nearly 50,000,000 of eggs were received. An estimate of those for the other stations gives a total of over 70,000,000 eggs of this species.

"In 1877 the German carp was introduced into America by the United States Fish Commission. These were placed in ponds, especially prepared for them, at Washington and Baltimore. In 1880 the distribution of fry began, and up to January 1st of this year, the carp have been planted in no less than 17,860 localities. They prove to be especially adapted to our waters, and in some localities they grow with surprising rapidity. A fish, 4 inches long, placed in the waters of Texas, was found to have increased to 20½ inches in eleven months, at which time it weighed 4 pounds 11 ounces."

The propagation work has increased in importance from year to year, as may be seen by the constant increase in the amount of the annual appropriation. A review of the results of the labours of the Commission, in increasing the food supply of the country, may be found in the annual reports; the rude appliances of fish culture in use ten years ago have given way to scientifically devised apparatus, by which millions of eggs are hatched where thousands were, and the demonstration of the possibility of stocking rivers and

lakes to any desired extent has been greatly strengthened. This work was for six years most efficiently directed by the late Mr. James W. Milner, and is now in charge of Major T. B. Ferguson, Assistant Commissioner, by whom has been devised the machinery for propagation on a gigantic scale by the aid of steam, and Col. Marshall McDonald, chief of the division of propagation.

The work of the Commission in fish culture has been that of stimulation and co-operation. The efforts of individuals have been encouraged in every way; indeed, there is hardly a fish culturist in the United States who is not or has not been attached to its staff. What was done in improving the methods of artificial propagation has already been summarised, and need not be repeated here.

The same policy of co-operation has been extended to the State Fish Commissioners and to fish culturists in every part of the world.

In 1877, the Commissioner and his staff were summoned to Halifax to serve as witnesses and experts before the Halifax Fishery Commission, then charged with the settlement of the amount of compensation to be paid by the United States for the privilege of participating in the fisheries of the Provinces. The information at that time available concerning the fisheries was found to be so slight and imperfect that a plan for systematic investigation of the subject was arranged and partially undertaken. In 1879 an arrangement was made with the Superintendent of the Tenth Census, with whose co-operation a complete survey of the fisheries was secured.

An elaborate illustrated report upon the Food Fishery and Fishery Industries is now in progress of publication.

Seven annual reports have been published, and one volume of the Bulletin, with an aggregate of 7,006 pages.

These cover the period from 1871 to 1879. Many papers relating to the work have been published elsewhere.

Thanking your Excellency, and you, my lords and gentlemen, for your kind attention, I will close this necessarily long address with the expression of the hope that the fisheries of Europe may derive from this great Exhibition a tithe of the advantages which are certain to result from it to the fisheries of the United States.

DISCUSSION.

The CHAIRMAN called on Mr. R. Edward Earll to be good enough to explain the diagrams and pictures upon the wall.

Mr. EARLL said he had enjoyed most thoroughly listening to Professor Goode's Paper, but national modesty would prevent his saying anything with regard to it, and he would proceed to give a few details of the working of the Commission during recent years. They had heard from this Paper, as well as from Professor Huxley, of the enormous quantity of fish consumed as food by other fishes in the sea and rivers, and it therefore became necessary, in order that fish culture should become practicable, and in any way increase the supply of fish in a country, that there should not only be thousands but millions of fish hatched annually. The attention of the Commission had therefore been turned recently towards improving the apparatus, to secure greater economy of space and concentration of work, and also towards devising more effective methods of distribution. Each specialist had taken up a special line of work, and had carried on his investigations until he had either introduced some new form of apparatus which had enabled him to accomplish better results, or had invented some form of apparatus for transporting fry

to a greater distance. Attention has also been turned to securing a larger number of eggs than was formerly obtained. At first the practice of the Commission was simply to attend the nets of the fishermen, and take such eggs as might be found in spawning females, but later it was found expedient to collect the fish and pen them until they should be ripened, when the eggs could be secured. In Grand Lake Streams, Maine, where the land-locked salmon were hatched, it became necessary to handle a large number of fish at a small cost. If the fish were to be secured one at a time, or taken from the nets of the fishermen, it would take a large number of men to handle them, and the cost of propagation would be enormous. The superintendent, Mr. Atkins, had therefore devised a plan of stretching nets across the mouth of the river which the fish ascended during the spawning season, and turning them from their course into net basins which were placed there. It then required no labour to catch the fish, except that of stretching the nets and placing the poles. The fish remained in the basin until they were ripe, requiring no food at the time, and the men went out with dip nets, took them, secured the eggs, and turned the fish back again into the stream. At the hatchery in California, in order to secure a large number of fish, a dam had been placed across the McLeod river, so that the fish might be intercepted in ascending, and be secured in considerable numbers in the immediate vicinity of the hatchery. At the white-fish hatcheries at Northville, Michigan, pounds had been made along the shore in which the fish were placed for a few days until the eggs were perfectly ripe, so that the entire number taken, or a very large percentage, might be impregnated. It was also found that the old method of handling the eggs, where they were spread out on trays in

single layers, required too much space, and it therefore became necessary to modify the apparatus from time to time so that larger quantities could be hatched. Recently the eggs of the shad had been hatched in jars, holding from 2½ to 3 quarts, in which could be placed 60,000 or 70,000 eggs, each jar being about two-thirds full. It had also been found desirable to concentrate the work of the hatcheries. Formerly it was supposed that these must be built in the vicinity of each important breeding-ground of the fish, and, that more ground might be covered, steam launches came into use: these, shortly before the time for the nets to be hauled, take in tow a number of boats, and proceed along the river bank, leaving men here and there at the various fisheries. After the eggs had been secured in the gathering boats, the steam-launches again took them in tow on its way to the hatchery. This was found to cause considerable delay, and the success was not all that could be desired. It has since been found desirable to pack the eggs by a method which was not formerly supposed possible—he was speaking now of the shad. They are now packed in trays, and a number of trays are put together with damp cloths between them; in this way they can be sent by a steamboat 50, 75, or 100 miles. Now, therefore, at the different hatching stations, men were sent out to the different fishing places along the river bank, simply provided with a tent, in which are placed rations for two months, a few spawning-pans, dippers, and pails, in which to impregnate the eggs, and a few of the crates in which the eggs were shipped. Arrangements were made with one of the river steamers to stop at these different landings to take on board the crates which had been filled with the eggs, and carry them to the hatchery. In this way ten times as much work could

be accomplished with the same number of men and an equal outlay of money. Another thing to which Professor Goode had alluded, was the establishment of floating hatcheries. The coast-line of the United States being so long, and the temperature so varied, it was found that the shad spawned along the extreme southern coast in the latter part of January, February, and March; later on, about the 1st of May, they were spawning in the waters of Maryland, and later still, in July, on the New England coast. In 1877 floating hatcheries, drawing comparatively little water, about 15 to 20 inches, were built, and taken in tow by steamers first to the waters of North Carolina; after the spawning season for shad had closed there, they were towed to the waters of Maryland, and the work prosecuted there during the height of the season, and later they were carried further northward. By this means the same plant could be utilised in a number of different localities. Another matter of importance was the building of refrigerators for retarding the development of the eggs until such time as they could be manipulated. The hatchery at Northville would accommodate scarcely more than 100,000,000 eggs, but it became desirable to hatch much larger quantities than that. A refrigerator was therefore being erected, the ice chamber being at the top, with pipes leading down to convey the cold air into the chamber containing the eggs, which were placed on trays one upon another, with an air space between them. They were kept there until one lot of eggs had been taken from the hatchery, when another was at once taken from the refrigerator and placed in it. The superintendent, Mr. Frank N. Clark, told him that he hoped to increase the quantity hatched in this way from 100,000,000 to at least 500,000,000, and he believed that it would enable him to distribute the fish during

a period of at least four months, and to extend the hatching period for three months beyond its natural limits.

The MARQUIS OF EXETER said he had been asked to move a vote of thanks to Professor Goode, and he felt that very few words of his were requisite in so doing, for he was sure the whole meeting would concur in giving him a most hearty vote of thanks for the very able, instructive, and exhaustive Paper which he had read. It entered so completely into the details of the great breeding establishments of the United States, that all who took an interest in pisciculture would derive great benefit from it, and it would enable them to improve their own establishments ; he was quite sure that many of the hints he heard would enable him to do so. He was glad of this opportunity of returning his sincere thanks to the Government of the United States and the Piscicultural Department, for the great kindness with which they had answered his questions, and furnished him with ova and everything he required for carrying out his small piscicultural experiments. Those fish which he exhibited in the collection were descended from eggs furnished him by the United States Department at the request of Sir Edward Thornton, and were nearly all American bred fish.

PROF. HUXLEY, in seconding the vote of thanks, said he should have had great pleasure in so doing under any circumstances, but it afforded him particular pleasure to do so because it appeared to him that on considering attentively the results of this large mass of observations and experiments upon the best methods of dealing with fishes of all classes, which had been carried out with such great activity and ingenuity by the United States Commission during the last ten years, there was as good a justification as he could wish to have for the propositions which he ventured to

submit on the occasion of the first Conference. He found that, practically, Professor Goode classified fishes into those which were very easily exhaustible, those which were exhaustible with more difficulty, and those which were practically inexhaustible. He would refer, as one particularly interesting case of practically inexhaustible fishes, to the diagram showing the results of the mackerel fishery, and he would beg of all those who had faith in human operations as contrasted with those of nature, to consider that diagram with attention. The great moral of the United States contribution to this Exhibition, and especially of the contribution which Mr. Brown Goode had just made to the Conferences, was that if this country, or any society which could be formed of sufficient extent to take up the question, was going to deal seriously with the sea fisheries, and not to let them take care of themselves as they had done for the last 1,000 years or so, they had a very considerable job before them; and unless they put into that organisation of fisheries, the energy, the ingenuity, the scientific knowledge, and the practical skill which characterised his friend Professor Baird, and his assistants, their efforts were not likely to come to very much good. One of his great reasons for desiring that the subject which Professor Goode had put before them should be laid distinctly before the English public was to give them a notion of what was needed if the fisheries were to be dealt with satisfactorily; for he did not think, speaking with all respect to the efforts made by Sweden, North Germany, Holland, and so forth, that any nation at the present time had comprehended the question of dealing with fish in so thorough, excellent, and scientific a spirit as that of the United States.

The vote of thanks was carried unanimously.

The MARQUIS OF HAMILTON said he had great pleasure

in proposing a vote of thanks to his Excellency Mr. Lowell, the American Minister, for presiding on the present occasion. The most interesting address delivered could not fail to form a subject of great interest to all connected with the fishing of this country, but the importance of the occasion had been considerably increased by the presence of Mr. Lowell. His name was familiar to all Englishmen, and wherever he appeared in public his presence was always greeted with enthusiasm, whether it was in making an amusing after-dinner speech or in presiding at an important conference like the present. They not only welcomed him, but they also welcomed other American gentlemen and ladies who were present. They desired to thank Mr. Lowell for the great interest he had taken in this Exhibition from its first inception, and also, as representative of the United States in England, for the great encouragement he had given the enterprise. The American nation played a very important part in the Exhibition, the magnificence and beauty of their exhibit being one of its chief attractions.

PROF. BROWN GOODE had much pleasure in seconding the motion, which was carried unanimously.

The CHAIRMAN, in reply, said as this was not an after-dinner occasion, neither a long nor an amusing speech would be expected from him. He was very much obliged for the warm manner in which the vote of thanks had been received, which he was entirely conscious of not deserving. It was his duty as well as his pleasure to be present that day, and be of what service he could, and he thought he might say without any national vanity that it was the wise and generous appropriation of £10,000 by the American Congress which did a great deal to encourage the Fisheries Exhibition at its outset, and he had been greatly gratified at hearing from the highest possible authority that the American

section was distinguished for its scientific arrangement, and, therefore, for its practical utility, and that a lesson might be learnt from it. He was particularly struck by one or two things in Professor Goode's discourse. The numbers which he cited the mind rather lost itself in, as it did in the vast distances of astronomy, but there were some other points which interested him particularly, especially one in which they were informed that the protection of fish in the United States was now due, if he understood it rightly, rather to individual effort, if he might so call it, on the part of societies than to any statutes. That was rather a curious as well as an interesting illustration of one at least of the results of that progress of democracy of which many people stood so much in terror. It was a remarkable fact, and recalled to his recollection something he was told a year or two ago by a gentleman from Pittsburg, who was then passing through London, in speaking of the riots in Pittsburg some ten years ago. He was in London at the time, and, therefore, did not know the facts. This gentleman said it was generally supposed that they were put down by the militia, but it was nothing of the kind ; the rioters put down the militia, but it was public opinion that put down the riots. He said it was perfectly true that when the strike of workmen began it was approved by public opinion ; that people thought the reduction of wages was unwise, that they were low enough already, but the moment the workpeople came to violence public opinion went round to the other side, and they were left as it were in a vacuum in which they could not breathe. The difficulty of protecting anything in a country so wide as the United States he remembered having a practical illustration of himself once, when the State of Maine endeavoured to protect the moose, which was becoming extinct. He, when up in the depths of the

forest there, encountered a trapper, who told him that he went 180 miles every winter into the forests beyond the settlements to set his traps. He had a canoe of birch, and on it he had burnt his name, and underneath the title "Moose Warden," and he said he would take care of all the moose that came within the reach of his rifle. Of course it was impossible for any warden under the statute of the State of Maine to approach him; but he believed the public opinion of the State of Maine did serve as a better protector of the moose. This sort of independence was typified in a fact concerning the American oyster which he had heard that day. The young of the European oyster were contained within their shell for a certain appreciable period, but the young of the American oyster were more adventurous, and were turned loose into the wide world of the oyster to look out and find for themselves. Professor Goode, in the introduction to his remarks, spoke of the importance of the New England fisheries in early times, and that importance could not be exaggerated. The fisheries were what the mines of California afterwards became, and perhaps would turn out to be a more valuable mine than they, but he had omitted one point which was of very great importance, and a point to which Burke alluded in his speech to the electors of Bristol when he spoke of those rude fishermen who had whitened every ocean with their sails. The great value of the fisheries as it was estimated in New England, and in the country at large even more so, was as a nursery for seamen, and one of the things which had impressed him in that Exhibition more agreeably than almost any other was the indication it gave that there were callings which summoned forth all those manly qualifications of daring, endurance, self-reliance, and self-sacrifice in a peaceful occupation which perhaps they had been too

easily led to think were dependent upon war for their cultivation. On the other side of the water the men who carried on these fisheries had always been encouraged, and sometimes by special bounties, and so important were they considered that in the State House of Massachusetts over the Speaker's chair there hung a model of a codfish as an emblem of what was then the most important industry of the State. As an emblem of silence he believed it had had no great effect in repressing the eloquence of the Chamber of Representatives, but the thought of it had so warning an effect on himself that he would not detain the Conference longer than to repeat his thanks for the cordial way in which the vote of thanks had been received.

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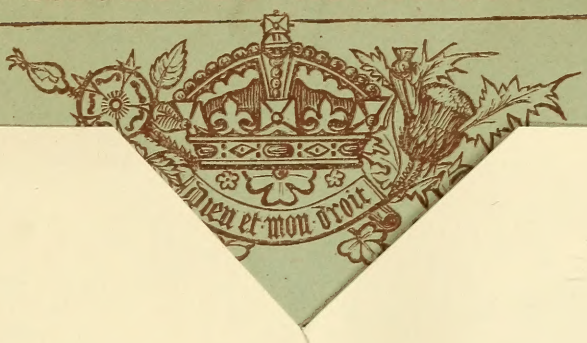

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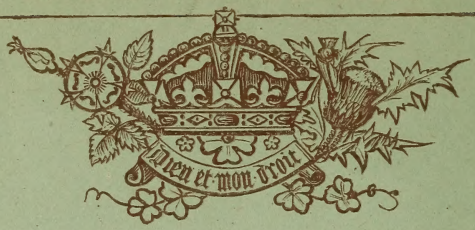

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Held in connection with

The GREAT INTERNATIONAL FISHERIES EXHIBITION

THE

FISHERY INDUSTRIES

OF THE

UNITED STATES

BY

G. BROWN GOODE, M.A.

ASSISTANT-DIRECTOR OF THE UNITED STATES NATIONAL MUSEUM, AND COMMISSIONER TO THE INTERNATIONAL FISHERIES EXHIBITION OF 1883

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